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# ENVIRONMENT VIEWS

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# *Coal*

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ENVIRONMENT VIEWS

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*Environment Views* is published bi-monthly by Alberta Environment. Each issue deals with a specific topic from various viewpoints with the aim of increasing awareness of environmental issues among Albertans. *Environment Views* is directed by an independent board with representation from environmental groups, government and industry. The views expressed by the publication are not necessarily those of Alberta Environment.

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Letters to the editor are welcomed, and should be sent to the editor,
*Environment Views*
*Alberta Environment,*
*Communications Branch*
*12th Floor, Oxbridge Place,*
*9820 - 106 Street,*
*Edmonton, Alberta T5K 2J6*

**Editor:**
Maryhelen Vicars
**Researcher:**
Susan Bramm

**Editorial Board:**
Jacquie Champion, Carey Johannesson, Jerry Lack, Jim Martin, Mardi Matthews, Dave McCoy, Ray Rasmussen, Stephen Tyler, and Bob Westbury.

The editorial board was helped in preparing this issue by Ken Crane, planning co-ordinator, Luscar, Ltd.; Betty Hunter, chairman, Heathburg Organization for the Protection of the Environment; Elaine Kobernick, president, Genesee Agricultural Protection Society; Richard Marshall, president, Coal Association of Canada; and Bob Paterson, manager, coal department, Energy Resources Conservation Board.

Alberta
ENVIRONMENT

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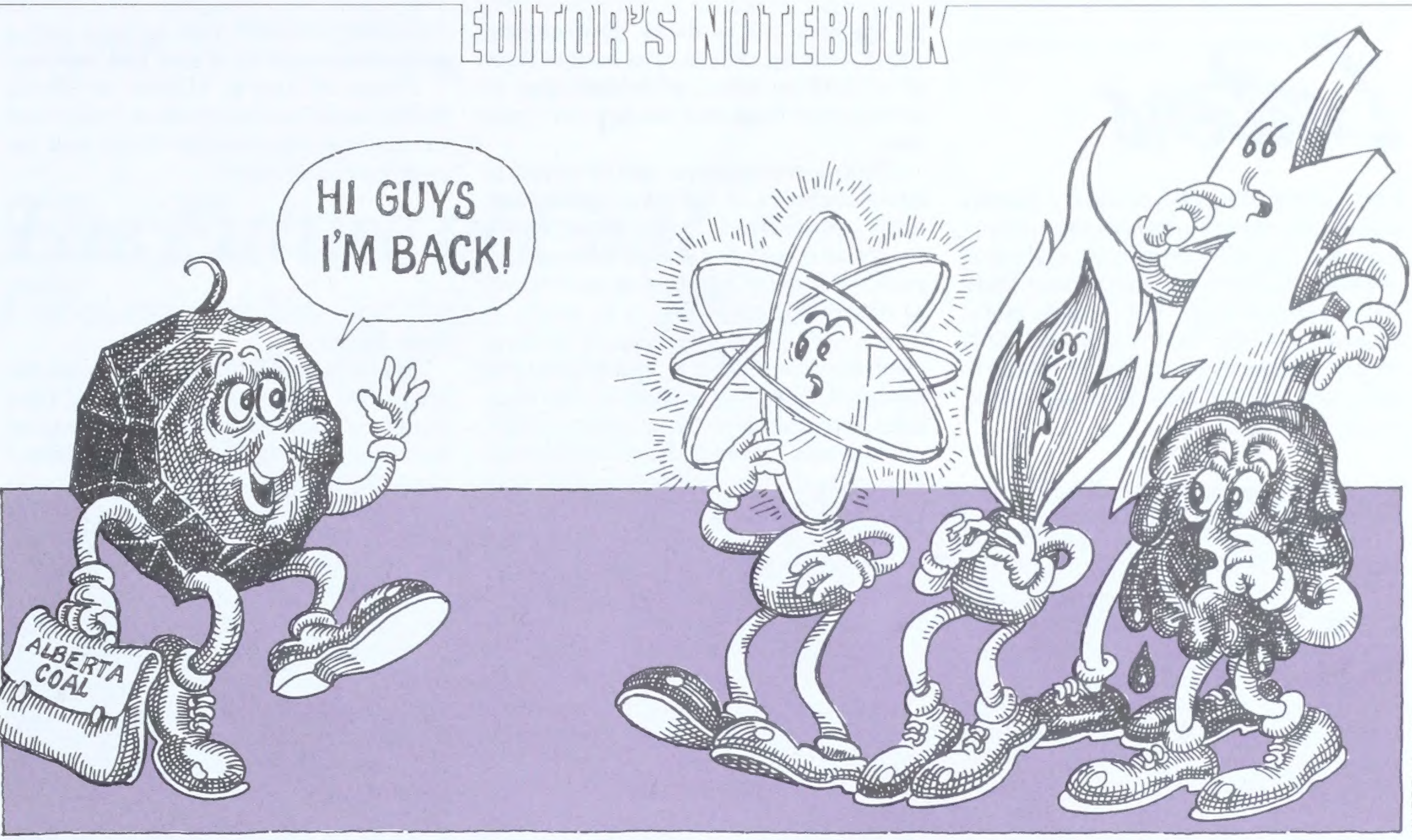
**Cover photo:** Luscar Ltd.'s Diplomat Mine. Gordon Henderson photo.

# EDITOR'S NOTEBOOK



WARREN CLARK

The average Albertan, challenged to describe the province's energy industry, will mention oil, natural gas, or the oil sands. Yet it is Alberta's vast reserves of coal which were the key to the province's prosperity in the early years and which will eventually take over as the dominant sector of the energy industry when the oil and gas run out.

Coal has been out of the energy limelight since the discovery of large reserves of oil and gas in the late 1940s, but as the stories in this issue outline, coal in its many forms is seen as a kind of "sleeping giant" waiting in the wings for the call of the international and domestic markets.

The editorial board chose to focus on coal for this issue of *Environment Views* in order to consider the impact the resurgence of coal may have, and to look at the state of the industry today. It is also interesting to consider the ways in which the coal industry provides a kind of case study in resource development. In this context, we have focussed on the economics of development, transportation and marketing; the emergence (and abandonment) of forms of new technology; and on the environmental and social impacts of coal development.

There are environmental impacts of both the mining and use of coal. At the mining stage, coal companies are required to follow guidelines designed to protect surface waters and groundwater from pollution. They are also required to conserve the quality and productivity of the land disrupted by surface mining. Topsoil is to be collected and protected before mining begins, and when the coal is depleted, the land must be "reclaimed"; it is to be re-contoured with its topsoil replaced and conditioned to return it to recreational or agricultural uses as soon as possible. There are to be no more "moonscapes", such as are common in coal areas of the U.S.

The use of coal has come under scrutiny lately as a contributor to two grave environmental problems we are facing globally: the greenhouse effect (the raising of the earth's temperatures by the increased concentrations of carbon dioxide in the atmosphere preventing the radiation of waste heat from the land); and acid precipitation, caused by the emission of oxides of nitrogen and sulphur.

In the social impact area, the coal industry has made progress in recent years, making greater efforts to involve and inform local people about development. Because of the scale of most of the coal development now undertaken, when a coal mine is planned for an agricultural area, for example, scores of farms and businesses can be affected. In our story on social impact, writer Jim Wilson discusses the impact on the hamlet of Keephills of a planned coal pit —the whole community had to be moved away from the site of the proposed mine to a new location some six kilometres away. (Incidentally, it is an interesting illustration of the difficulties of forecasting energy markets that the pit was not in fact developed by TransAlta Utilities Ltd. and may not now be needed for a number of years.)

Overshadowed as it has been by the attention paid to natural gas and oil in the past few decades, there may be some tendency to think of the coal industry as primarily a relic of Alberta's past.

Towns like Coleman, Robb, Cadomin or Diamond City were bustling centres of industry in the days when coal fired the railroads and heated almost everything throughout the west.

While Helen Corbett's story looks at these centres at the peak of their prosperity with some nostalgia for their rich community life, few would turn the clock back to the appalling working and safety conditions of those years. The statement from a federal discussion paper on coal that "The single greatest environmental advantage of coal is that society has already experienced the industry at its worst" applies also to mine safety.

While we look at this issue at research being undertaken into all aspects of the coal industry, there are some observers who fear we may not be doing enough to prepare for the day when Alberta coal *will* be called upon to fill the breach left by unaffordable or scarce oil and gas. Engineer Levy Siega, who runs the small Warburg Coal Company and is interested in developing a compressed coal log for fireplaces, and University of Alberta professor Dr. Norbert Berkowitz both caution against complacency about the preparation needed for a smooth transition to a future dependent on coal.

Maryhelen Vicars, a former journalist, is the freelance editor of *Environment Views*.

# Letters

Environment Views has received a number of supportive letters in recent weeks, following media reports that its future might be in jeopardy. To borrow a phrase from Mark Twain, we are happy that reports of the magazine's demise were exaggerated. Still, we were glad to hear from fans. We'd like to hear from you, too, with your suggestions, comments or criticism.

To: The Honorable Fred D. Bradley
Minister, Alberta Environment

Dear Mr. Bradley:

Recent media coverage raises the possibility that Environment Views will be discontinued as an economy measure. I sincerely hope that this will not happen.

Environment Views is an excellent publication, with invariably well-researched and well-written articles. As well as being a source of information for the interested public, it is without doubt a useful reference for government employees, industry, consultants and educational institutions. In terms of value for money spent, I'm sure it would rate very well in comparison to most government expenditures.

Some stories reveal a state of less than perfection in Alberta environmental matters. The fact that such situations can be brought out and discussed in a government-funded publication reflects an honesty and openness that is commendable — surely no cause for concern.

Please keep Environment Views coming. If the budget pinches, look elsewhere for cuts, such as the Vegreville Environmental Centre or the extremely high costs of engineering works and land purchases, to mention just a few obvious places.

G.M. Smart
S.C.S. Consulting Ltd.
Edmonton

Dear Mr. Bradley:

Recent press reports relating to the possible demise of the *Environment Views* magazine are viewed as very disconcerting.

The Off-Campus Activities Team of the Calgary Board of Education is concerned with all educational excursions taken by students and teachers, and also with outdoor and environmental education for the 83,000 students enrolled in all Calgary public schools.

Over the years, *Environment Views* has been a tremendous educational resource used by teachers and students. *Environment Views* is timely, current, tries hard to show all sides of an issue and exhibits that its authors have researched the facts very carefully.

Though the magazine can be viewed as interdisciplinary, it has great relevance to many school subjects, be it a Social Studies "issue-based study", a factual study of hazardous wastes in Chemistry or an art study of Alberta historical sites.

One of the main advantages of *Environment Views* is that it is locally (Alberta) produced. Locally produced, or even Canadian produced curriculum materal is difficult to obtain. Unbiased current background material is often not available to classroom teachers in such a well-written well-researched manner.

If the magazine *Environment Views* were to cease publication, many classrooms, libraries and students would be poorer for its loss.

*Alberta Environment* would lose an opportunity to produce the "environmentally aware citizen" who can look at environmental issues from more than one perspective.

Nestor N. Kelba, Supervisor
Off-Campus Activities
Calgary Board of Education

Dear Mr. Bradley:

I am writing to you about the publication *Environment Views* which is written, produced and circulated under the general aegis of your Department of the Environment's communications branch.

It should be pointed out that this magazine is somewhat unique in Canada and, very likely, North America. Its content is usually timely and topical and, more importantly, the articles provide information which directs careful and thoughtful attention to the many facets of environmental issues. In many cases, that data and information described may serve to expose a certain "side" to some negative criticism. However, to its credit, the magazine attempts to approach issues with as little bias as possible.

Another unique element of the publication is the practical educational usage to which it can be put in the classroom. Not only is it possible for the teacher to utilize the information in an appropriate fashion in elements of the science, health, social studies or environmental programs, but the guide-sheet provided with the magazine points out curricular connections in a very palatable way.

Both as a former supervisor (Off-Campus Activities) with the Calgary Board of Education and in my more recent capacity of Coordinator of Environmental Education for Alberta Education I was able to utilize the *Environment Views* magazine in a very productive fashion. As the principal of an elementary school I hope to have such a publication available to staff and students.

I hope, sir, that as Minister of Alberta Environment you will do all in your power to maintain *Environment Views* and the integrity of its content.

J.R. Houghton
Principal, Keeler School
Calgary

Dear Editor:

Would it be possible to send me another copy of the issue on indoor pollution? I lent it out to someone who inadvertently recycled it with the newspapers. As I keep all issues, I would hate to not have this one.

When the agricultural land hearings are finished will there be a concise report on the findings? For many years I have been concerned about the disappearance of farmland, and have written letters and briefs as well as supported organizations who stood for preservation. There are still many people who say the Agricultural Land Reserve in B.C. is a "socialist plot" (words of one of the SC ministers) and people who would like to build wall to wall houses on the good farmland we have left in B.C. What is the general feeling in Alberta? I have read and underlined many of the points in your Agricultural Lands issue and I can't understand how people can be so blind as to expect that food will come from "somewhere " at ever affordable prices in the near and far future. Maybe after the hearings are over another issue could be devoted to farmland as well as to solutions to assure a good income for the farmers. Food takes priority over housing, as the latter can be shared.

I enjoy your magazine and read every issue entirely.

Elly Roelofsen
Victoria, B.C.

Dear Editor:

I have just recently received a copy of the September/October issue and find it very good. I think it would be suitable to distribute to the public, primarily those looking for water quality information.

If possible, I would like to request a supply of about 25 - 35 copies to keep on hand in this office.

Peter H. Schonekess
Water Quality Control Branch
Calgary

*more letters page 32*

Norma Ramage

# The Future of Coal

## Forecasting markets and future uses is a difficult task

An aerial view of Luscar Ltd.'s Diplomat Mine.

HENDERSON PHOTOGRAPHY

It's like trying to put together a jigsaw puzzle while someone keeps hiding or changing the pieces. Well nigh impossible.

That's the problem facing anyone trying to predict the future of coal in Alberta and Canada. Everybody agrees the final picture is clear: It is axiomatic that as oil and gas supplies dwindle, coal will become more and more crucial to the world's energy supplies.

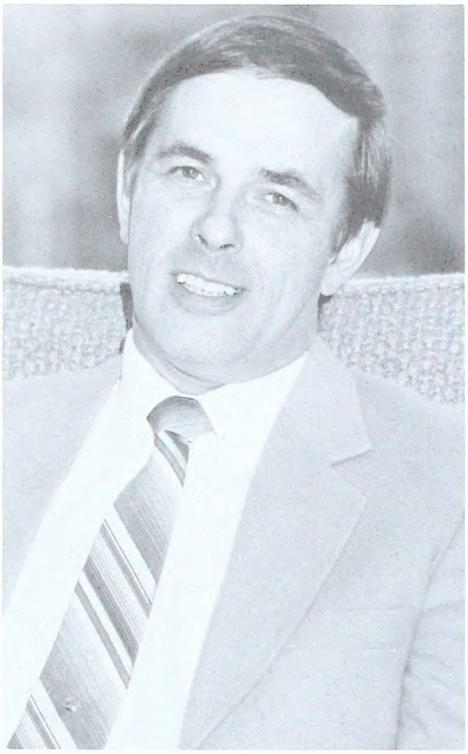
What no one is able to agree on, however, is how soon this picture will become reality. Is there a new coal boom just around the corner? Or is that something that will have to wait for our children's or our grandchildren's time? There are so many variables that accurate predictions on the future of coal is virtually impossible.

In the late 1970s, with the term energy crisis on everybody's lips, with OPEC shoving oil prices into the stratosphere and with a booming world economy gulping oil and gas reserves at an alarming rate, it seemed safe to predict that King Coal's day was coming again.

Prestigious organizations such as the International Energy Agency predicted a coal boom was only a decade away. Closer to home, a special Canada West Foundation task force urged governments, business and the public to turn their attention to coal as a means of filling the forthcoming energy gap.

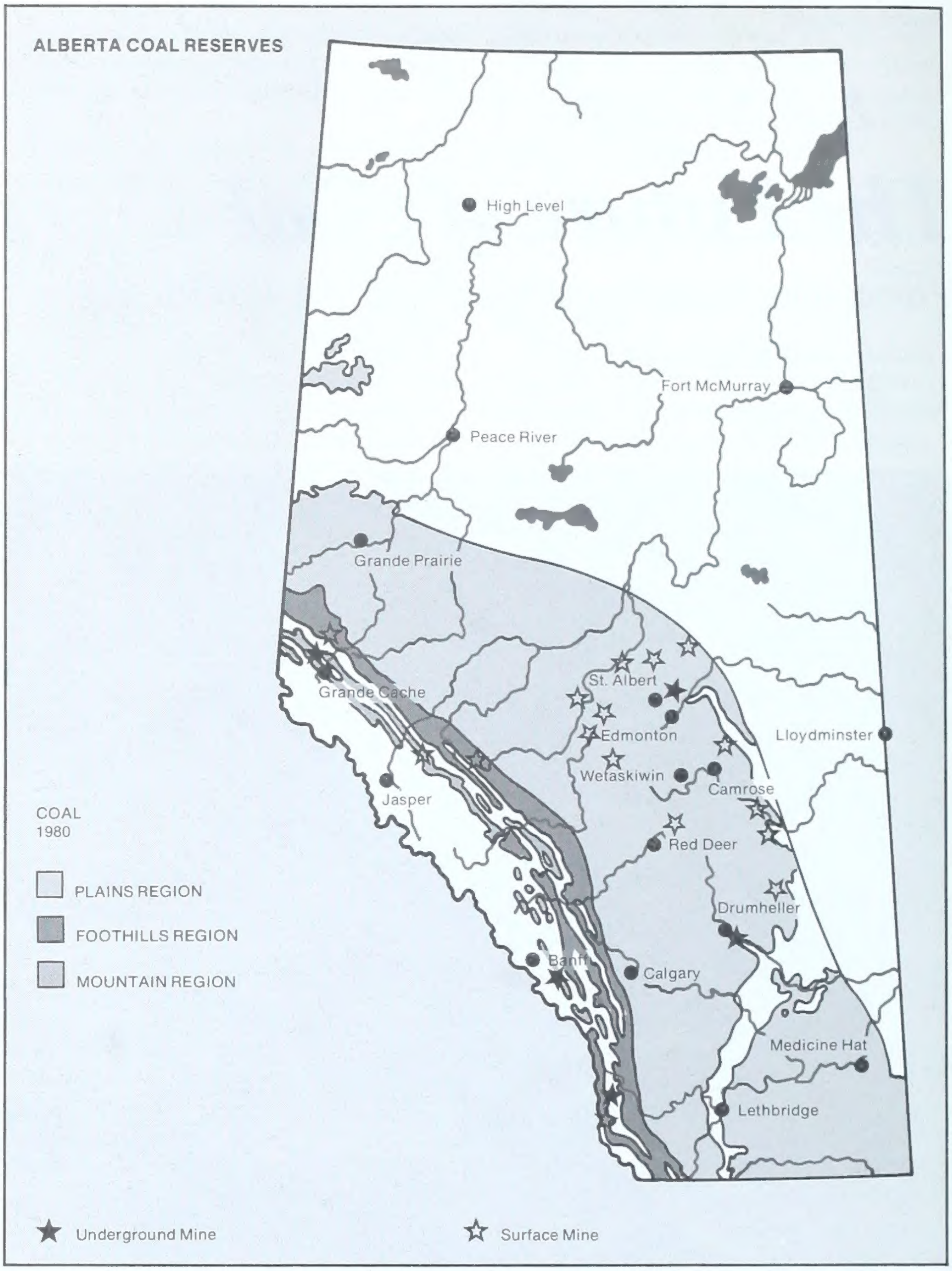
The World Coal Study of 1980 concluded that by the year 2000 world coal production would triple to meet increasing energy demands as conventional oil supplies would be able to fill less than 30 per cent of the world's energy needs. Everything seemed set for the re-awakening of what the Canada West task force called The Sleeping Giant.

But in the last few years, the pieces of the



SUSAN BRUN

**Bob Paterson**



ALBERTA ENERGY AND NATURAL RESOURCES

jigsaw puzzle have been rearranged. While most experts agree that coal will play an increasingly vital role in the world energy picture — it is after all the world's largest energy resource — the time lines have been lengthened substantially.

For example, Richard Marshall, president of the Coal Association of Canada, says: "I would think coal production will have a steady growth but it will be slower than we have experienced in the past decade."

Bob Paterson, manager of the Energy Resources Conservation Board's coal department, agrees the boom might be further away than originally thought. "The current recession has resulted in a decrease in many forecasts and some plants scheduled for the 1990s may be set back as much as five years."

The major reason for the delay is that coal is inextricably linked to oil and gas. The world recession has caused a decline in the demand for oil and natural gas and resulting lower prices. In addition, major energy conservation programs instituted by western governments in the wake of the 1973 energy crisis have started to take hold and there is a world surplus of both oil and gas. The result is that the desperate rush to find alternate energy sources, such as coal, has slowed down.

But Paterson says this is only a temporary recession.

"Even if the oil cartel (OPEC) actually falls apart, there will just be a lot of scrambling to put cheap oil on the market and that will simply deplete accessible sources that much faster," Paterson explains.

Even in today's recessionary economy, a recent World Bank study estimates energy demand will increase at a rate of two to three per cent annually after the end of this decade and that at least 35 per cent of this expected increase will have to be met by coal.

Marshall points out, however, that growth in coal production is nothing new. The Association's statistics show a steady growth in production from 15,063 kilotonnes in 1970 to 42,810 kilotonnes in 1982. He feels an annual increase of three to three-and-a-half per cent isn't unlikely and "compared to the real growth in many industries and to the real growth of this country's economy, that figure looks pretty darn good."

However, Marshall is concerned about people who talk of a "coal boom". "That's a dangerous word. We have lots of optimism about the coal industry but we don't want to get caught up in the boom mentality. Growth is still there but it's not going to happen overnight."

But whether it turns out to be steady growth or overnight boom, Canada, and epecially Alberta, will be in the forefront of coal development. Canada is the world's fifth largest coal producer and 70 per cent of that coal is in Alberta with smaller deposits in British Columbia, Saskatchewan, Nova Scotia and New Brunswick. In fact, coal deposits underlie about 300,000 square kilometres of Alberta, or almost half the entire province!

Statistics from the Energy Resources Conversation Board show Alberta has coal reserves of 48 billion tonnes of which almost 17 billion tonnes are recoverable using existing technology. This amount of coal has an energy value equivalent to 65 billion barrels of oil, about 10 times Canada's proven crude oil reserves.

Alberta coal is found in the mountains and the foothills but the bulk of it, some 83 per cent, is found in the plains.

The higher grade, higher heat producing bituminous coal is found in the mountains and foothills and most of this is shipped overseas, primarily to Japan and other Pacific Rim countries, as metallurgical coal for use in steel production.

The sub-bituminous coal of the plains produces less heat (BTUs) when it burns and is used primarily to fuel power plants in Alberta.

According to Peter Roxborough, chairman of the steering committee of the Electrical Utilities Planning Council, over three quarters of the electrical power in Alberta is generated by coal-fired plants.

"Thirty years ago, a lot of plants were being built to be fired by natural gas because it was cheaper and cleaner," explains Roxborough.

But we (TransAlta Utilities) foresaw natural gas couldn't always remain that cheap and the switchover to coal started about 20 years ago."

In addition, the provincial government, in an attempt to preserve natural gas supplies, implemented a policy of prohibiting any base level energy from being produced by using oil or natural gas, so all future power plants in Alberta will have to use coal, hydroelectric or nuclear power. In most cases, says Roxborough, the choice will be coal because it is cheap and readily available.

It is thermal coal, shipped to other parts of Canada, to the Pacific Rim and to Germany, that is likely to produce the largest future markets for Alberta, says Paul Demcoe, senior coal advisor with Alberta Energy and Natural Resources.

BILL BRENNAN

**Paul Demcoe**

"There's not likely to be another metallurgical mine open by 1990. The big markets right now are for thermal coal," says Demcoe. Countries like Japan, anxious to overcome their dependence on foreign cartels for the energy vital to industry, are investing in coal mines in Alberta and elsewhere in Canada.

But like everything else to do with coal, predicting markets and future uses is a difficult task. One of the complicating factors is the extent to which nuclear energy will be adopted as a means of producing electricity.

In Scandinavia, recent public outcry about the dangers of nuclear power had forced those countries to change to coal-fired power plants, says Paterson. But in the United States, despite the near disaster of Three Mile Island and the virtual abandonment of a major western nuclear U.S. power project, plans to increase nuclear powered generating plants are going ahead and in France, it is estimated that 95 per cent of that country's power will be provided by nuclear energy by the end of the century.

"But if we should anywhere along the line have another nuclear accident, watch out," says Demcoe.

"Everybody will switch to coal and the industry will take off like a scalded cat."

But at the moment the coal industry is on hold and that means exploration, too, has slowed down.

Coal exploration is a costly business and without guaranteed new markets there is little incentive. Add to this the recession and the negative effects of the National Energy Policy, explains Marshall, and it is understandable that exploration has "dropped off".

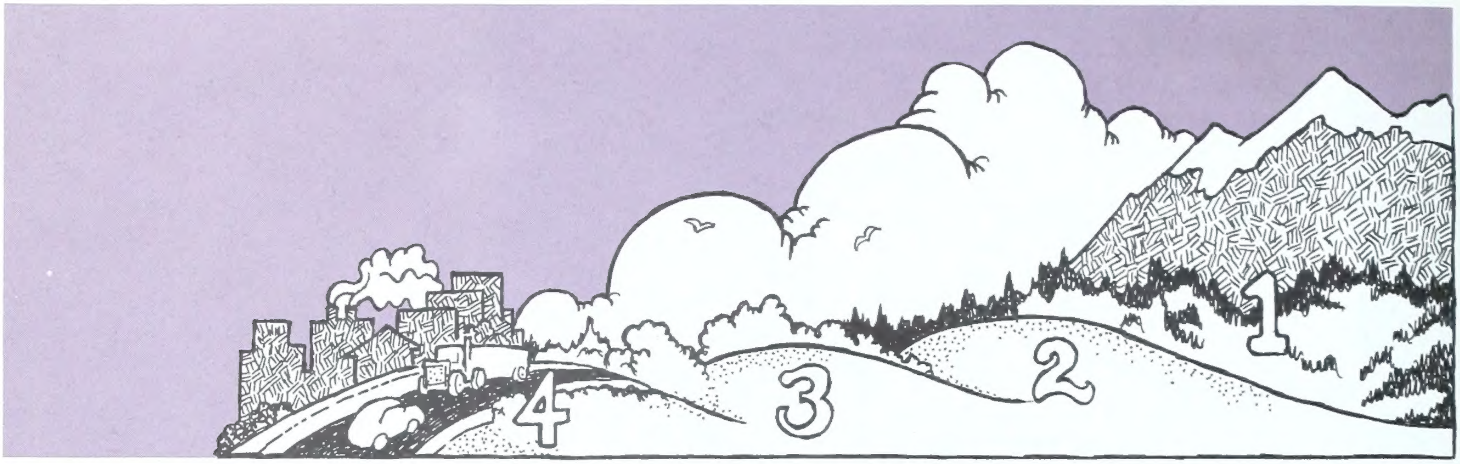
"Certainly there are companies out in the field. Gulf Oil, for example, is active in north-central B.C. right now. And there are others. But there are a lot fewer companies now than there were a few years ago because of the recession so there's a lot less exploration."

And exploration is not as vital to the coal industry as it is to the oil industry because the location of most coal reserves is already known.

"There won't be any startling deposits show up that we don't know about," explains Marshall. "It's just that the areas are not proven up to exact tonnages."

Exploration will depend very much on future demand and that demand, says Demcoe, will depend on whether we can give good value for the energy dollar. In that area, a major problem is transportation costs.

For example, Ontario is Alberta's major coal customer in Canada but its purchases from this province are severely limited simply because Alberta coal is more than twice as expensive as that available from Eastern U.S. suppliers. The reason? Transportation costs.



MARTHA JONES

Says Paterson: "We have the most efficient unit train system in the world with the CPR and CNR but we have just too many miles to cross."

Reducing these transportation costs is one of the thrusts of ongoing coal research, says Doug McDonald, executive director of ENR's scientific and engineering services division. One way being investigated is mixing coal in a liquid slurry and sending it along a pipeline.

Another possibility is to send coal in liquid or gaseous form, because more can be transported for the same unit cost.

Other, more exotic research is also going on and last year the provincial government spent $20 million on coal research. The main thrust of this research, says McDonald, is to convert coal into liquid and gaseous products which will replace oil and natural gas.

"For example, the best fuel for a car is some kind of liquid. So we look at replacing petroleum with a liquid produced from coal."

The technology already exists, indeed has existed for over 50 years, for turning coal into oil and gas. The problem, says McDonald, is that it is prohibitively expensive. That problem is now being tackled by research groups.

But the direction of that research is changing like everything else in the coal industry as people's perceptions of energy needs change, says McDonald. With the energy panic of the '70s fading, there is less urgency now to develop an immediate substitute for oil and natural gas and increased emphasis on finding more efficient ways to use coal in its conventional form.

"In a year I hope I can say that instead of looking for ways to convert coal we will also be looking for ways of improving the burning of conventional coal, of reducing the environmental damage caused by coal use and coal mining and we'll be looking for new uses and applications for conventional coal," McDonald explains.

BILL BRENNAN

**Doug McDonald**

Coal producers agree research is vital to future development of the industry but they pinpoint one other vital factor necessary for orderly development — government co-operation. Producers have complained that government procedures for the issuing of approvals are unnecessarily complex, time consuming and costly for producers.

But the big concern among coal producers, says the Coal Association's Marshall, is "increased government involvement". But so far that hasn't happened and Marshall adds that both federal and provincial governments have been "very supportive" of the coal industry.

"Oh, there have been a few conflict areas like permitting but I can't say that any government is working against us."

Marshall also praises the provincial government's wide-ranging "A Coal Development Policy for Alberta" which came out in 1976 and which is currently being revised.

The policy deals with a number of concerns including coal leases, royalty agreements, markets and research. It also stringently controls development of coal areas, dividing the province into four control zones. Category 1 lands are those in which no exploration will be permitted and these include most of the environmentally sensitive high mountain areas of the Eastern Slopes.

Category 2 lands are those "in which limited exploration is desirable and may be permitted under strict control but in which commercial development by surface mining will not normally be considered at the present time," says the policy. These include mountain and foothill areas for which the preferred land use has yet to be determined as well as environmentally sensitive areas.

Category 3 lands are those in which surface and underground mining will be allowed but subject to stringent controls that ensure protection of the environment and reclamation of the land. The policy requires that "such lands will be reclaimed to a level of productivity equal to or greater than that which existed prior to mining."

Category 4 lands are those not considered to be as environmentally sensitive as those in categories 1 to 3 but there, too, the policy allows mining "subject to proper assurances respecting protection of the environment and reclamation of disturbed lands."

Demcoe explains that the policy, which has also received acclaim from environmental groups, was ahead of its time and was intended to help development of the coal industry by providing an orderly and consistent approach.

"We also wanted to let the public and industry know under what guidelines development would be allowed," says Demcoe.

"It's important that people know that modern coal mining isn't going to be like the old horror stories of tips and pits and scars on the land. We are not going to have a wasteland."

The policy coal development is currently under review, according to Bob Paterson. An executive summary has been sent to the Coal Association and to government departments asking for their responses to proposed changes.

Norma Ramage is a Calgary journalism instructor and freelance writer.

Susan Bramm

# *Managing Coal Development*

## Minimizing environmental damage through planning and site management

Performing major surgery on Mother Earth isn't easy or beautiful. Careful planning is needed to achieve efficient and complete extraction while keeping the patient (and her inhabitants) healthy.

For coal developers, this presents a complex challenge in environmental mangement and co-operation with government regulating bodies.

Surface coal mining is a massive "materials handling" exercise. (see illustration on following page). All kinds of stuff on top of the coal has to be removed, to be stockpiled on site or hauled away. The coal must be taken from the seam, processed if necessary, and then transported off site. Then topsoil, overburden and wastes from processing are appropriately redistributed to reclaim the site.

Today, mining must be carried out so that the negative environmental impacts of all these phases are minimized. Much of this effort directly benefits the company, while some measures are required by law, to benefit the surrounding environment and communities.

Some negative consequences of coal mining are unavoidable, although others can be prevented or minimized by careful planning and on-site management.

The most obvious impact of a surface coal mine is its disruptive land use. It not only replaces existing land uses such as forestry, agriculture or wildlife habitat, but during mining the land is vulnerable to erosion.

Sometimes the land can be returned to its orignal uses as soon as five years after initial disturbance. In some cases, uses such as fish and wildlife habitat and migration may never be restored.

Ron Millson, habitat protection biologist for Alberta Fish and Wildlife, says, "The impact on fisheries is usually more severe than on wildlife, primarily due to sedimentation. This can affect the productivity of the streams and the reproductive success of fish populations.

"We attempt to handle this problem by working closely with Alberta Environment and the company to encourage water handling systems that reduce the silt levels."

WELL, THERE GOES THE NEIGHBORHOOD!
MARTHA JONES

Air pollution can be a problem at almost every stage of a surface mining operation. Airborne dust can be controlled by such measures as locating stockpiles in sheltered areas and revegetating mined areas as soon as possible. Other control measures for coal dust are stipulated in the regulations of the Clean Air Act. Wet scrubbers are required on the stacks of the coal-fired thermal dryers used to dry the coal, for example.

Coal mining causes changes to the distribution, quantity and quality of surface water in the immediate and surrounding area. Many of these changes are regulated by permits and licences issued by Alberta Environment. For example, a licence is required to divert water flowing into the development, and proper stream crossings for all access roads and rail lines must be constructed.

Alberta Environment's "Alberta Coal Mining Waste Water Effluent Guidelines" outline how the control, treatment and release of water associated with the entire project area, including the wastewaters generated from processing should be carried out. The overall objective of these measures is to reduce the "levels of contaminants in mine wastewater and the volume of discharge where practicable". The company's plans form the basis for the permit and licence issued under the Clean Water Act to operate its wastewater treatment and coal processing facilities.

For example, if the mine wastewaters do not meet specified standards, adequate control and treatment facilities, such as retention ponds, must be built prior to clearing and excavation of the mining area they are designed to serve. Additional treatment of water contaminated by oil and grease, iron or heavy metals may be required. In order to reduce sediment loadings, water courses must be protected from materials eroding from stock piles.

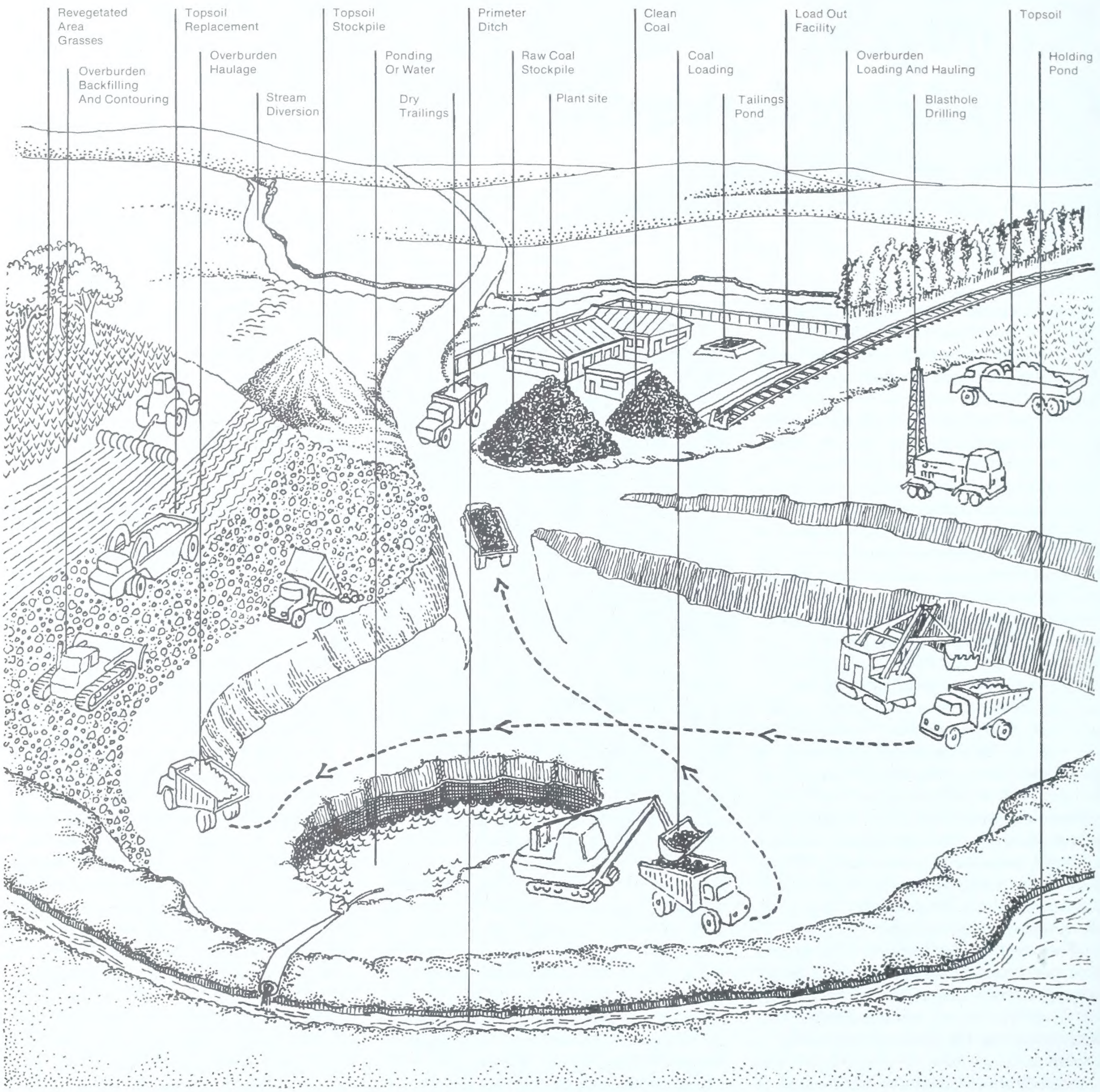
Most on-site processing of coal is designed to use recycled water and produce minimal liquid wastes. Under the Clean Water Act no process wastewater and plant site runoff to natural drainage is allowed, except as a result of natural seepage or a severe storm. In most cases the solids are extracted, mixed with overburden and backfilled. All process plants are required to have emergency tailings ponds in case of process breakdown.

Until recently the effects of large scale surface mining on regional groundwater resources and the role of groundwater in reclaimed areas were unknown. The Plains Hydrology and Reclamation Project, being conducted by the Alberta Research Council and funded by the Reclamation Research and Technical Advisory Committee was initiated in 1979 to investigate these impacts at two large active mines in central Alberta.

The physical alteration and dewatering of the mine site will cause local drawdown of the water table. "We are finding that the groundwater table re-establishes itself more quickly within the mine area than had been expected" says Paul Ziemkiewicz, chairman of RRTAC. The impact on regional groundwater levels will require long term examination.

Beneath the mining area saline ground-

**OPEN PIT MINE OPERATION**



WARREN CLARK

water usually results, due in part to the tendency of spoil material (the dirt that has been disturbed in the course of mining) to generate salts. Preliminary results indicate that water quality impacts may remain local. "In only one case has saline groundwater moved into an aquifer [outside the mine area]" Ziemkiewicz says.

The research project also involved studies of how groundwater movement and quality affect the success of reclamation efforts. For example, early results indicate that the water table tends to remain far enough below reconstructed soils, to prevent the salinization of them. For problem areas, "we are looking at landscape designs that will allow groundwater to stay away from the surface."

Reclaimed land does not appear to be a good source of groundwater for domestic use, due to the high salt loading within it and its poor flow characteristics. However, most of the salts from mine spoils are leached out within the first year after mining. After these initial reaction it is still not known what happens to them. "These are thing we are looking at now", says Ziemkiewicz.

Groundwater re-establishment in the mine area also relates to how materials have been replaced. In the plains project, factors such as differential compaction are being studied to identify techniques that will alleviate subsidence.

"End-pit" lakes, created by water filling in the last pit or row of a mine, can be an attractive amenity of the reclaimed mine area, but can only succeed if carefully planned.

Susan Bramm is *Environment Views'* researcher and a member of the editorial board of the magazine

Bernie Goedhart

# *Putting Coal to Use*

## International and domestic markets are slipping — for now

To say that Richard Marshall is bullish on coal is to understate the situation. Even a brief telephone interview has him waxing eloquent on the coal industry: "It can be a very rewarding experience, working in coal. Taking something from the ground, developing it, watching towns grow up around it . . ."

"I'm keen on the industry. It's given me a good life."

With a 20-year background in the business, the president of the Coal Association of Canada expresses optimism about the future of coal.

"Our total export quota is 16 million tonnes a year — exports worth $1 billion a year."

SUSAN BRUN

**Richard Marshall**

Nothing to sneeze at.

But there's an irony here, and Marshall readily acknowledges it. While Canada exports 16 million tonnes a year — most of it from Alberta and British Columbia — it also *imports* 16 million tonnes a year.

The bulk of those imports are to Ontario, to generate electricity and to fire the country's steel mills. The irony is that Alberta's mountain region contains metallurgical coal used in the steel industry — bituminous deposits ranging from low-to high-volatile rank. But this coal is shipped mostly to Japan, not to Ontario.

Transportation costs are the culprit.

It may be ironic that the steel mills in Ontario import their coal from Illinois, Pennsylvania and Kentucky, but "it makes economic business sense," says Marshall. "They're within two or three hundred miles (of Ontario), while (Alberta coal) would have 1,500 or 2,000 miles to go."

"Transportation is the big problem facing this industry," he says. "Our railways are some of the most efficient at moving bulk commodities, but this is a big country and we're in the middle of a recession." (Despite these difficulties, he says, 25 per cent of Ontario's thermal coal supply comes from Alberta.)

Economic times being what they are, this is not coal's finest hour. Japan, Alberta's largest customer for metallurgical coal (exports of 3.1 million tonnes of cleaned coal to that country in 1982), has been seeking price cuts as well as reducing the amount of coal it purchases. "With the recession in their steel industry, there has been a total across-the-board reduction of shipments of about 25 to 28 per cent," says Bob Paterson, manager of the coal department of the Energy Resources Conservation Board.

And the pinch is being felt domestically as well. In 1982, the domestic market in Canada used about 25.7 million tonnes – 25.5 million tonnes of it thermal coal, says Marshall.

About three-quarters of Alberta's coal supply is thermal coal, the type used for space heating and thermal power generation. "Eighty-five per cent of the electrical power generated in Alberta is produced by coal," Marshall notes.

"But the demand for electricity is dropping."

Consumers are conserving energy, insulating their homes to cut heating costs – anything to reduce those utility bills.

So for the present things don't look good. "No-one is terribly optimistic in the short-range future for a dramatic turn-around," says Paterson. "But I think the long-term prospects for coal — and I may be an optimist — are good."

**John Railton**

He's not alone in that opinion. Marshall shares his optimism. "I've been in the business long enough to see this kind of (rise and fall)," says the coal association president, adding that "the market for coal is a finicky one."

John Railton, manager of environmental planning for TransAlta Utilities, acknowledges that power consumption has dropped off. As the predominant user of coal in Alberta is the power industry, there has also been a drop in demand for thermal coal.

TransAlta, the province's largest coal user, producing 67 per cent of the power in Alberta, nevertheless projects a positive forecast. Admittedly, it's slightly less positive than it was. "We've had to decrease our forecast of about a 7.6-per-cent increase. On the decade, we're (looking at) a 4- or 4.5-per-cent increase."

Still, an increase is an increase.

The Highvale Mine on the south side of Lake Wabamun, west of Edmonton, supplies coal to two thermal plants: Sundance, a 2,100-megawatt plant, and Keephills, now a 400-megawatt plant which will be an 800-megawatt plant next year.

Railton says that 9.1 million metric tonnes of coal will be mined at Highvale to supply Sundance and Keephills in 1983.

# Marketing Fly and Bottom Ash

**Al Slessor**

Fly ash and bottom ash are by-products of coal-burning plants. The marketing of the two is a relatively new aspect of the Alberta coal industry, and any discussion of its merits soon becomes heavy with references to how useful fly ash is when mixed with concrete.

But even ash has its lighter moments.

Take the kitty-litter story. "Oh, you heard about that?" says Robert Bellows, supervising engineer for fuel supply of Alberta Power Ltd. It is Bellows' job —among other things — to deal with the disposal of his company's fly and bottom ash.

PAUL ZEMKIEWICZ — ENERGY AND NATURAL RESOURCES

He, too, talks a lot about things like using fly ash as a concrete extender ("it has workability . . . it increases the strength – makes the concrete more dense", etc.). Bottom ash is less widely applied (Its chief use is as a fill material — it drains well).

But it's the bottom ash, coarse and more granular than the fly ash, that captured the imagination of an Edmonton entrepreneur who approached Alberta Power about wanting to try the stuff out as kitty litter. "He buys kitty litter from somewhere in the States, bags and sells it, but he wasn't happy with that stuff, (so) he has been field-testing our bottom ash."

While kitty litter may never shape up as a major use for bottom ash, Alberta's Power is always working on developing new markets and expanding old ones.

Using Alberta Power's Battle River plant near Forestburg as example for an explanation of the source of this ash, Bellows sketches a generating unit that hangs from a ceiling and is suspended in a trough of water. Coal is crushed, ground and blown into the unit as a powder and burned. The five generating units at Battle River are about 10 storeys tall.

Fly ash — a fine, greyish-white powder — rises in the unit, while the bottom ash drops into the water, where it cools "and breaks up so you can collect it." The fly ash is caught between electrostatic precipitators and passes into a silo. "At Battle River we just have one (silo) for all the big units," says Bellows. "Two years ago, in the summer, we could sell all the fly ash we could produce.

"It's very seasonal . . . In the winter you're producing more because more heat is used (by power customers). In 1981, when things were booming, we were considering building storage units so we could sell in summer what we produced in winter. But we're not considering that now."

These days, however, Alberta Power isn't selling all of its fly ash. "If we can't sell it, it's mixed with a little water to control the dust and then we haul it to the mine and bury it in the pit. We bury it in deep enough so that we don't hurt the agriculture."

Alberta Power uses a broker to sell fly ash. TransAlta Utilities, the major user of coal and producer of power in Alberta, has a subsidiary — TransAlta Fly Ash Ltd. — to do the job.

Al Slessor, sales manager for TransAlta Fly Ash, says that company is not selling all of its fly ash either and "obviously would like to see markets developed."

Construction is a prime target, he says, adding that fly ash is also used in the oil industry — as part of the muds used in oilwell drilling.

Fly ash can be used in road stabilization, mixed with lime or cement. It may also be useful as canal-lining stabilization material, says Slessor, and as such it could be useful in irrigation. "When you're getting on expansive clays as base material, you always get a lot of heaving and cracking and you lose a lot of irrigation water." Fly ash is a more flexible ingredient, he says, adding that tests with respect to the irrigation possibilities was being done at the Lethbridge research station.

The entire field of fly and bottom ash usage needs more research and development if it is to become widely accepted in Canada, says Slessor. European and Australian markets are much better developed. In Japan, bottom ash has been used as lightweight aggregate, in the manufacture of such things as building blocks.

"We're just scratching the surface over here," says Slessor.

Bottom ash, for example, is useful as a structural fill material and in landscaping as a base material. "In my own little garden (at home) I put some bottom ash in with a layer of top soil over it. It works fine. It holds the water better than sand."

Using bottom ash as a soil amendment in soil test plots at Battle River (left).

Bellows says Alberta Power is using fly and bottom ash in land reclamation at the mine sites. "We have found at Battle River that if you don't have top soil, you can just put a layer of bottom ash on top.

"It's a funny material, though. It's hard to drive equipment on it."

Slide photographs of the Battle River site show scenes that are barren in the foreground, with poplars in the back. Bottom ash was used where the poplars now stand.

"Shipping is the biggest constraint to optimum use of this stuff," says Bellows, noting that bottom ash may be a good building fill but "if you can't afford to bring it in then you use the sand next door."

The farthest Alberta Power has shipped its fly ash is to British Columbia — the Revelstoke dam project.

Betty Hunter, chairman of the Environment Council of Alberta's non-renewable resources study group, says her group is concerned about fly ash because "environmentally, you hate to see something that comes from a non-renewable resource wasted."

In other countries, much greater use seems to be made of fly and bottom ash, she says. "In Japan, for instance, they have used bottom ash in the making of building blocks. And somewhere in the New England states I believe they have experimented with using bottom ash as insulation material, like fibreglass."

When the ECA holds its annual conference in December (in Banff), Mrs. Hunter's study group will present a resolution that the department of agriculture be asked "to use their research facilities to examine (the feasibility of) using fly ash in the making of irrigation ditches."

"I would say that, environmentally, we're wasting fly ash," Mrs. Hunter says, adding that increased experimentation into possible uses is called for. "And perhaps people need to be made more aware" of existing and potential uses of both fly and bottom ash.

— Bernie Goedhart

**Roger Bellows**

"By 1988, that'll be about 11.4 million."

Meanwhile, development of some plants already approved by the ERCB has been deferred a year or so because of the downturn in the Japanese economy, says Paterson. Manalta Coal Ltd. this year announced "a year's slippage" in plans for that company's Mercoal and McLeod River mines. The two Hinton-area projects had already been recommended for approval by the ERCB.

Railton says his company is applying for a delay in the case of the Genesee plant, which was scheduled for 1984 completion.

And Roger Bellows, of Alberta Power Ltd., says application has been made to the ERCB to delay the Sheerness project to January, 1986. That plant, which Alberta Power is building in partnership with TransAlta, is scheduled to begin operating in mid-1985, says Bellows, Alberta Power's supervising engineer for fuel supply.

Bellows, too, is optimistic — in the long-term view. "Oil *is* going to run out. And coal is a viable source (of energy)."

Alberta's major coal users are concerned about pending federal guidelines governing sulphur emission from coal-fired plants. "We're worried they're going to require us to install (flue) scrubbers," says Bellows, adding that the scrubbers "remove sulphur from the gases before it goes up the stack." Alberta coal has a very low sulphur content.

Paterson admits that requiring this kind of sulphur-dioxide control in the province "*could* mean a considerable increase in cost to (power) customers."

Railton says "as long as people are willing to pay for such things" flue scrubbers can be installed. But he notes that his company's last rate increase met with considerable opposition from its customers.

He predicts the national emission guidelines would add 20 per cent to the cost of a new plant.

Railton says one of the guidelines involves a "720 hour limit". The plant would have to conduct hourly tests to ensure it meets a specified sulphur emission level ("less than 258 nannogram per joule") over 720 hours. "Then there would be a short-term limit over and above that which we would have to meet." The latter would be set by the provincial government.

All of which, needless to say, would cost money.

Serge Dobko, head of Alberta Environment's air-quality branch, division of standards and approvals, doesn't see much immediate cause for alarm. In the first place, there are no regulations in place provincially only proposed guidelines.

These guidelines would affect only projects approved after a certain date; any plant already having ERCB approval would not be required to install flue scrubbers, for example, should they become required.

Dobko says there are plants which were approved in 1980 and still not built. Projects now scheduled to come on stream anywhere from 1984 to 1990 already have approval and therefore would not be affected.

The fact that Alberta's coal generally has a less than one-per-cent sulphur content points out another irony in the industry.

Requiring plants to install flue scrubbers would stem from a federal government guideline aimed primarily at eastern Canada but applied to the country as a whole, notes Railton.

"The problem in the west is not the same as in the east.

"One can't dismiss acid rain, but it's not the same problem in Alberta (as in Ontario)."

Bellows agrees. "I think our next plant will have to have scrubbers. And we don't need them.

"In Ontario, I wouldn't want to see them burn coal without them."

Bernie Goedhart is a freelance book reviewer and writer in Edmonton

Helen Corbett

# Alberta's Coal History

## The first recorded mining began almost 200 years ago

The town of Coleman, with the old coking ovens of Coleman Collieries in the foreground.

SUSAN BRUN

When he finished his shift in the Canmore coal mines, an Italian miner named as Lawrence Grassi was busy blazing trails, erecting bridges over mountain streams and building wayside huts for hikers and skiers.

Life as a coal miner during the early years of this century was one of the most physically taxing jobs imaginable. Still, that never deterred Grassi from setting off for the mountains with axe over shoulder to enable others to share the beauty he saw.

It wasn't unusual to find men like Lawrence Grassi in the coal mining towns of Alberta. He epitomized the spirit of the men who worked in the mines: tough enough to withstand the mine life, yet caring for the community around him. During a mine strike, it was typical of Grassi that he led a work party in building a swimming pool around two natural sulpher springs.

"Coal mining is the most precarious of the resource industries," says Doug MacFarlane, a geologist who worked as a coal miner in his native town of Coleman. "A sense of fatality ran through it: when you went to work there was a pretty good chance you wouldn't come back. Or you might not go at all because the market had collapsed."

Yet coal communities were "great to live in," says MacFarlane. "People didn't have much money but everyone was in the same boat. If you were pouring concrete, 20 or 30 people showed up to help. The women cooked and there was plenty of beer.

"Bit by bit this sense of community was eroded as people made more money, and became conscious of having more than their neighbors."

What coal mining has lost in community cohesiveness, it has gained in other areas. Miners have no regrets about the passing of the harsh working conditions, poor pay and inadequate housing common to the early days of mining.

Coal forms the bedrock of Alberta history. The Indians were familiar with the properties of the "stones that burn." The earliest explorers mention coal exposures that occurred prominently in various parts of the province. Indeed, the earliest recorded mining took place in 1793 by Hudson's Bay explorer and trader Peter Fidler, who discovered an outcropping of coal along Rosebud Creek in Drumheller Valley.

In Edmonton, enterprising young men dug shafts along the banks of the North

Mountain Park, Alberta.

Saskatchewan River. Two or three men would work the mine, hewing the coal car rails from spruce logs.

"These were completely unrecorded entries," says Dr. J.D. Campbell, of the Alberta Research Council's coal department. "The miners would make a straight entry into the river bank in fall, sell coal all winter and close up in spring. Today, it's a continuing catastrophe for the construction industry —trying to build on land riddled with uncharted tunnels.

It wasn't until 1870 that a gold-seeking Irishman named Nicholas Sheran started Alberta's first commercial mine. Finding coal instead of gold, he arranged to ship it by bull team to Fort Benton two years later.

The coming of the railway brought foreign capital to finance western coal mines. Sir Alexander Galt organized a mine on the east side of the Belly River in 1882 on what is now Lethbridge. The mine was financed by English capital, and had an assured market: the Canadian Pacific Railway required about 3,000 tonnes of coal each month.

The next two decades saw a flurry of activity as mines opened and closed, financed by American, French, British and German capital. The Great Western Coke and Coal Boom would last until 1918, fuelled by the railroads' voracious appetite for locomotive boiler fuel.

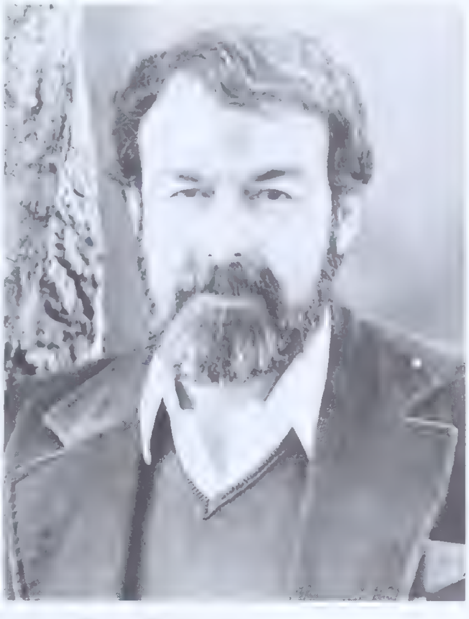
Anthracite, Georgetown and Canmore mines opened in the Cascade Basin of the Rockies. The Canmore mine, with its steeply-pitched seams and large number of faults, presented miners with some of the most difficult mining conditions in the country.

The Crowsnest coal field opened up with the south branch of the CPR. Coal companies and new towns sprang up overnight to meet the fuel demand for railways, B.C. smelters, and domestic needs. Rows of coking ovens were built in Coleman, enabling the coal to be coked right at the mine site.

In 1909, a Canadian National Railway spur line southwest of Edson established the Coal Branch. Booming towns called Robb, Coalspur, Sterco, Mercoal, Lovett, Luscar and Cadomin were quickly set up, linked only by a railroad to the outside world. Mountain Park, the lovely town at the end of the spur claimed the distinction as the "highest civilized point in Canada."

Drumheller was the last major coal field to open during the boom, supplying a lower-grade bituminous coal suitable for domestic heating.

Suddenly there were too many mines in Alberta and the industry was in a state of overproduction. While few mines worked at capacity, the markets were subject to seasonal demands for their product. Miners, rarely working full-time, were forced to find other jobs to supplement their income.



SUSAN BRUN

**Doug MacFarlane**

World War I temporarily solved this problem, as coal was in heavy demand to fuel troop and freight trains carrying war materials and to power the industrial smelters. The end of the war in 1918 did not spell an immediate drop in coal production — demand actually increased over the next 18 months — but renewed uncertainty soon followed.

Coal miners began to become organized soon after the CPR's Crowsnest line opened coal areas in 1895. Worker discontent in Lethbridge turned into Alberta's first coal strike three years later, when management cut wages by 17 per cent.

"The union movement grew out of atrocious conditions," says MacFarlane. "Miners didn't necessarily want more money, they just wanted to feed their families and not die in the process. Miners became the most militant union types. If you were tough enough to work in a mine, you were tough enough to take on the boss."

Safety precautions in the mines were almost nonexistent, and death and injury were common. One historian estimates one miner was killed for every 100,000 tonnes of coal mined in Alberta.

The first great mining disaster was at Bellevue in 1910 when 31 miners died in a cave-in. A coroner's jury found the company negligent in ensuring the Mines Act was properly enforced. After the findings were released the Bellevue miners walked off the job, refusing to return until the management found a way to prevent cave-ins.

Alberta's worst mining disaster came four years later when a fire-damp explosion took the lives of 189 miners in Hillcrest. Almost the entire working population of the town was wiped out in the accident.

Families lived by the sound of the mine whistle. Seven short blasts signalled an accident.

"The ambulance was a chain-driven dumptruck, that moved with the speed of seven goats," MacFarlane recalls of his Coleman childhood. "No shouting, no hysteria — just the women quietly walking, wearing babushkas. The ambulance would pass, four or five miners standing in the back, their eyes gleaming from their black faces like vaudeville actors. And the hurt guy spread out between them, his feet sticking out of the dumpbox."

The everpresent sense of fatality was eased by the intense sports rivalry among coal towns: Crowsnest Pass, Lethbridge, Canmore, Drumheller. Soccer was the popular game in the Crowsnest, while the Coal Branch went in for tennis, boasting courts in three towns. Hockey was the favorite sport in Canmore. The hockey rivalry was so in-

# Mine Safety

A mine rescue team at Coal Creek, B.C. 1912.

GLENBOW ARCHIVES

No one will deny that coal mining is still a hazardous profession. However, modern technology and increasingly stringent government health and safety regulations have reduced the hazards.

One of the most dangerous kinds of mining is underground mining. The history of the Canadian coal industry is studded with examples like the Springhill, Nova Scotia disaster, dramatic accidents where men have been trapped underground for days or weeks and sometimes forever.

But new technology has helped to reduce the likelihood of another Springhill. Mechanization of the industry has meant that instead of 10 men working on a coal face, the work can be done by one man and a machine. And recent innovations such as hydraulic mining and longwall mining, that are now being introduced to Canada, mean the process can be completely mechanized, particularly in the deeper and consequently potentially more dangerous levels of a mine.

Remote-controlled equipment now monitors air quality and helps to prevent underground explosions while the traditional caged canary carried underground has been replaced by more sophisticated and more reliable early warning systems that watch for dangerous levels of toxic gases.

Coal companies have also introduced extensive training programs including instruction in first aid and rescue procedures.

And perhaps the most infamous of all coal mining hazards — the dreaded Black Lung — is on its way to becoming a thing of the past, too, according to Greg Smith of the mines inspection branch of Alberta Workers' Health and Safety.

"Most of the cases we see now are not recent ones," says Smith. "You catch Black Lung by inhaling fine coal dust over a number of years. It's not something that happens overnight and most of the cases we see now started years ago."

There are even parts of the world, such as the United Kingdom, where Black Lung appears to have been totally eradicted, says Smith.

In Alberta and elsewhere in Canada, stringent government regulations control the amount of dust in the air.

Frequent inspections make sure these standards are maintained, explains Smith. Owners are required to take advantage of modern ventilation technology to keep the dust out of the air or to use water vapor to pull the dust harmlessly from the atmosphere.

The results of efforts by both business and government have been "a significant change" for the better in mine safety.

— Norma Ramage

Coal exploration by packhorse, 1890 (left)

Horsedrawn coal cars at Reid Hill Mine southeast of Vulcan, 1921 (below)

GLENBOW ARCHIVES

tense between Bankhead and Canmore that fans carried little switches and hit members of opposing teams as they skated by. Players learned to skate clear of the boards.

As for culture, Canmore had the only log opera house in Canada, packing in the community for Wednesday and Saturday matinees. Cadomin, in the Coal Branch, was the only town between Edmonton and Vancouver with a symphony orchestra. The mine attracted excellent musicians by offering jobs around the mine, and ensured good crowds by collecting the ticket money through the payrolls.

Ethnic lines were drawn in the communities with each wave of settlement. MacFarlane can count over 40 different ethnic groups in the Crowsnest.

"There was suspiciousness between the groups, but it didn't last past the second generation," he says. "There was too much intermarriage."

The only ethnic group not assimilated was the Chinese, who were employed as cheap labor at the mine surface. Fifty Chinese people worked in Canmore in 1920, living separate from the town, where they tended bountiful gardens.

The Great Depression saw mine orders all but cease. Miners worked one or two days a week. Each evening the Canmore coal community listened for the mine whistle: one blast meant work, three signalled no work.

World War II brought a prompt end to the Depression. Mining production rose, and miners were once again in demand. The federal government, alarmed that younger miners were leaving the pits for other jobs, froze all miners to the mines in 1943.

Coal rose to its greatest heights at the end of the war. Nearly nine million tons of coal were produced in 1949 before the crash came.

"The federal government had encouraged coal production during the war and people burned coal domestically for the war effort," says Campbell. "In the early 1950s, it just crashed, with the discovery of oil and gas, and the dieselization of the railroads. By 1953, mines were closing at a terrific rate."

For the next 20 years of cheap and plentiful oil and natural gas, coal mining went into an eclipse. Only low-grade thermal coal mining expanded, with coal-fired power plants consuming 10 million tons of coal at Lake Wabamum each year.

In late 1968, another coal boom revived the sagging industry. This time the market was for high-grade metallurgical or coking coal, to fuel the Japanese steel industry.

"Some of the more enterprising mines —among them Cardinal River, Grande Cache, Coleman Collieries and Canmore — recognized a market in their coal," says MacFarlane. "The boom lasted until the early 1980s when the demand for steel disappeared."

Today, the complexion of mining has changed enormously. Where 400 mines once operated in the province, there are now fewer than 20. The cost of transporting coal, and the modern technology required to efficiently extract it, has made the small mine obsolete.

"Small mines involved endless drudgery and labor not tolerated by our society today," says Campbell.

But whatever the boom and bust atmosphere of the coal industry, there is always the odd hold-out. A testimony to the perseverance of the coal miner was the small two-man operation at Reedhill, east of Vulcan. Two Italian miners worked the mine for over 30 years, wielding a pick and shovel as they lay on their bellies. Their coal was practically hand-picked, and the quality of it was so high it enabled them to stay in business.

"They worked terrifically long hours, with little or no help," says Campbell. "They probably left Italy when it was horribly depressed. They knew no other way of life."

Helen Corbett is a former journalist now working as a freelance writer and film maker out of Canmore

# *Rediscovered Technology*

Coal liquefaction. Gasification of coal. In situ production of gas from coal.

When today's resource research scientists toss around this kind of terminology it turns the lay man goggle-eyed with wonder and admiration. Shades of Future Shock and Isaac Asimov! The brave new world of energy production is here.

Actually, it's been here for quite some time. Liquefaction, gasification and in situ gasification of coal are products of a technology that has been around for over 50 years, and, in some cases, for well over a century!

When the Nazi Messerschmitts, Stukas and Junkers swooped over Britain during the Blitz, the fuel in their tanks was a high octane mixture produced from liquefying coal.

And the gas lights that looked down on Jack the Ripper's rampage through London's Whitechapel were run on gas produced from coal.

"Town gas or blue gas (gas produced from coal) has been around since the last century," explains Bob Gregory, a senior engineer with Nova, An Alberta Company.

"Major European cities and the older Eastern U.S. cities were lit by coal gas in the 19th century although it wasn't used much in Canada," says Gregory, one of the authors of Coal: The Sleeping Giant, a 1980 report on the future of coal produced by the Canada West Foundation.

And, says Gregory, the I.G. Farben process that is the basis of today's liquefaction technology was invented in Germany in the 1920s and was in widespread use in that country and throughout Europe in the 1930s as a fuel for streetcars, automobiles and warplanes.

Even in situ gas production, the process by which gas is produced from coal right in the mine, was being used in the U.S.S.R. in the early 1930s.

Gasification has been welcomed by environmentalists as an alterantive to the land disturbance associated with surface mines.

BILL BRENNAN

**Norbert Berkowitz**

Although a variety of processes have been developed to produce gases and liquids from coal, they are all based on the fact that the principal chemical constituents of coal are the same as those of oil and gas. Simply put, the conversion results from increasing the proportion of hydrogen to carbon which is done by adding hydrogen, in the form of water or steam, to the coal.

Gasification and liquefaction are still being carried out today, most notably in South Africa, which has no domestic supplies of oil and natural gas. The Sasol I and II plants, using Lurgi gasifiers and the Fischr-Tropsch synthesis process developed in Germany in the 1920s produced 1.5 million tonnes of gasoline and diesel fuel in 1979.

But the big stumbling block to widespread use of coal conversion methods is the cost, says R.D. McDonald, executive director of the scientific and engineering services branch of Alberta Energy and Natural Resources.

The Canada West Foundation's 1980 report estimated it would cost between $1 and $2 billion to build the smallest economically feasible conversion plant. Such a plant would produce 50,000 barrels of liquid fuel a day, a capacity slightly greater than the production of the original Suncor plant.

With the availability of cheap oil and natural gas after the Second World War, interest in conversion technology dwindled. Interest was revived, however, in the 1970s with the energy crunch and increasing concern over dwindling oil and gas supplies.

The Alberta Research Council undertook Canada's first and only underground gasification test in the field in 1975 and 1976.

"This is technology we could be using at the turn of the century, when the gas bubble breaks," says Dr. Norbert Berkowitz, professor of mineral engineering at the University of Alberta.

Coal is converted into methane gas by steam-heating it under high pressure. The coal bed is ignited, air is pumped in and the resulting gases, including methane (the principal component of natural gas) are pumped out as the fire smolders.

The result is a combustible fuel with 15 per cent of the heat value of natural gas, suitable for power generation.

"We were indeed at the leading edge of this technology," says Berkowitz, who was ARC's head of coal research at the time.

The five-year testing program did not receive the $1 million per year from Energy and Natural Resources required to finish the experiments.

"Whatever lead we achieved has been eroded by the continuing work being done in the United States and other countries. The time will come when we need such technologies. At that time we may be forced to buy someone else's research, hurriedly adapt it, and possibly make mistakes we could have avoided."

— Norma Ramage and Helen Corbett

Sharon Adams

# *Today's Coal Industry*

## Changes in markets, regulations and policy

HENDERSON PHOTOGRAPHY

Loaded coal train at Luscar's Diplomat Mine

"Coal policy," says the Canada West Foundation in its 1980 task force report on coal in Western Canada, "is carved more in butter than in stone." Although the industry has been in the province for a century, it's enjoying — some would say enduring — a second childhood.

New markets, new and tougher legislation, a new public interest in the environment and the industry's metamorphosis from small-scale operations to megaprojects – all ensure policy and regulation will continue to be in flux, just as household rules change as a family copes with bringing a child through the various stages of development to adulthood.

And as in the average family, this has caused some tension.

While industry is concerned with economically meeting its commitments to customers, and argues it must have a stable legislative background on which to plan and budget, government wants to ensure the maximum benefit is obtained from development of the coal resource, while preserving other resources for future development and use. This means that as new techniques are developed, they must be incorporated into existing legislation.

"Industry, government, the public . . . we're all learning," says Bruce Patterson, land conservation co-ordinator for Environment's land reclamation division. "The amount known in the environmental area alone has quadrupled in just five years. Therefore legislation must be flexible so we can stay on top of the situation."

So many departments and so many policies, acts, regulations and guidelines are involved, and the industry itself is changing so quickly, the government is leery of hard-and-fast rules. So, after a gruelling approval process, mines are normally given five-year operating licenses. "This gives us a chance to update requirements every five years, and gives industry something solid on which to plan and budget.

But Dr. John Railton, a forecaster for TransAlta Utilities Corporation and chairman of the Coal Association of Canada's environment and reclamation committee, says industry's major negative reaction is not to acts and regulations, but "to policies, guidelines and letters of intent.

"There has been varying interpretation of policy over time as new individuals got involved. Everybody's growing, learning. We still have a major problem: in order to run a company well, you need to know when guidelines and regulations are coming out so you can time permit and license applications. But often, we're faced with an imminent request to respond to, and haven't planned for it in our budget. Also, when you don't know why the changes are taking place, it sets up a confrontatory situation."

"The coal industry was regulated strongly and quickly . . . first and primarily in the environmental area, then in reclamation. And in the past few years, increasing attention has been paid to occupational health and safety," says Ken Crane, manager of environmental planning for Luscar Ltd.

Part of this increased legislative activity is due to the phenomenal recent growth in the industry.

In the 1930s, coal was the principal source of energy in Canada. The west's 400 mines employed 14,500 workers and produced eight million tonnes annually. Most of the coal produced was used for space heating or in the boilers of railroad or ships' engines. By 1950, coal still accounted for more than 50 per cent of the country's energy supply.

The oil boom changed all that. By 1960, coal supplied only 20 per cent of Canada's energy. Railway conversion to diesel fuel caused the virtual demise of the industry in

Alberta.

But just as oil's increasing good fortunes caused the coal industry to shrink, the oil production and pricing crises of the 1970s worked to coal's advantage.

In 1970, western Canada produced 13 million tonnes; by 1979, production had risen to 30.5 million tonnes.

Changes in markets, coal usage, public interest in the environment and government regulation have transformed the industry, says Crane.

"In the late 1960s a market materialized in Japan for coking coal (bituminous coal for steel-making) and (Japanese customers) were looking for a diversity of supply. Then the OPEC (Organization of Petroleum Exporting Countries) scare of the mid-'70s caused many businesses to look for an alternate fuel to oil and gas."

Chief among these businesses was the power industry. Many utilities converted from gas-fired to coal-fired generation of electricity. Ontario Hydro, fearing U.S. supplies could be limited or eliminated, looked to western Canada for part of its supply. Luscar, only one of Ontario Hydro's suppliers, produces approximately two million tonnes annually for this one customer.

"The size of operations today," says Crane, "is a reflection of the overall scale of operation everywhere. It takes two million tonnes per year to fire one 375-magawatt unit." Utility customers must spread their contracts among several suppliers.

So the market accounts for part of the dramatic change. While there's been a 350 per cent increases in coal production between 1930 and 1978, the number of mines in western Canada has declined from 378 to 19; the number of employees has been halved. About 43 per cent of western coal is exported, while 52 per cent now goes into thermal power generation.

Size of contracts and length of supply made the old mining operations, which were almost exclusively underground, obsolete. Enter the surface or pit mine. And the mega-project.

In addition, sophisticated, large-use buyers demand a more perfect product.

"Rather than just mining the coal, sending it through a tipple for crushing and sizing before sending it out, it now has to be processed to meet customers' requirements," says Crane.

Today's customers demand the maximum heat value from coal. This requires processing to remove moisture, ash and dirt and raise the caloric content.

The size of the industry has produced a fundamental change in industry — a demand for financial and technical strength from large, adequately-staffed, adequately-financed corporations. Today, nine major corporations account for 95 per cent of coal production.

As the customer was demanding more from the industry, so were the public and government.

"The regulatory process in Alberta is a multi-department, multi-agency process. It's complex," says Bob Paterson, manager of the Energy Resources Conservation Board's (ERCB) coal department. "As a technical advisory board to government, you could say we play the middle ground between government and industry."

The ERCB co-ordinates the public and departmental concerns, and presents industry with one of its major regulatory hurdles.

While the board's mandate is to conserve the province's natural resources and assure their efficient, safe and economic development, it also assures that public and departmental concerns are aired and included in its recommendation to cabinet.

"In giving our approval," says Paterson, "we look at various aspects. A coal project in Alberta has to benefit a majority of sectors. We weigh two factors: the return to the province in payroll, capital investment, employment and taxation; and then we compare that with the costs — facilities for increased population in the area and such intangibles as the quality of life. That's where the public can really help us through the public hearings."

The economic cost-benefit analysis cannot be overstated. While reclamation is desirable to protect future interests in other resources, excessively high standards for reclamation could put a mine out of business. "We have to consider the overall economics of the project, and reclamation is considered part of the process. Its cost is worked in." Environment's Bruce Patterson says the development of reclamation and conservation policy can be broken into three stages. The first, prior to 1963, he calls the "remedial" stage.

**Ken Crane**

"The only requirement on industry under the old Coal Mines Regulation Act was to leave (the site) in a safe condition."

The "cosmetic" stage came between 1963 and 1968 when companies were required to level the site so the surface owner could work it later. Though some companies were required to do some preliminary stripping of soil and soil salvage, it wasn't universal.

The modern era began in 1973 when the Land Surface Conservation and Reclamation Act began to require companies to plan land conservation and reclamation into development.

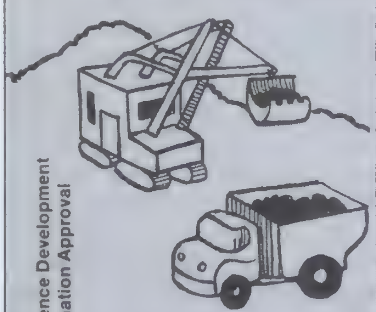
"In the early '70s, to the old-line miners, reclamation was just a nuisance. We had to overcome that attitude through an education process."

"It's slowly evolving. Over the last decade, there's been a better appreciation on both sides of what the other does. The mining people know what it's about, what is going to be done, and why."

Larry Brocke, chairman of the Development and Reclamation Review Committee, says this is an important process. Under the regulations of the new act, issued in 1974, the committee can recommend approval, refusal, or approval with conditions, of a mine's application.

**THE APPROVAL PROCESS FOR DEVELOPMENT IN ALBERTA**

| | Proponent's Actions | Agency Response |
|---|---|---|
| Obtaining Mineral Rights | Lease application submitted to Alberta Energy & Natural Resources (ENR) Minerals Division | |
| | | Reviewed by Crown Minerals Disposition Review Committee approval issued/denied by Minerals Division |
| Obtaining Exploration Approval | Application submitted to Land Conservation and Reclamation Council (LCR) | |
| | | Reviewed by Exploration Review Committee, approval granted or rejected by Alberta Environment, ENR and ERC |
| Preliminary Disclosure | Preliminary disclosure submitted to ENR | |
| | | Review by government agencies and endorsed, rejected or deferred |
| Mine Permit & Processing Plant Approval | Mine permit/processing plant application made to ERCB | |
| | | Review by ERCB and government agencies, deficiencies identified for response by proponent |
| | Environmental Impact Assessment (EIA) submitted to Alberta Environment (AE) | |
| | | ERCB Public Hearing |
| Mine Licence Development & Reclamation Approval | Mine licence and development and reclamation applications submitted to ERCB | |
| | | ERCB makes decision regarding project, cabinet approval/rejection given |
| | | ERCB mine permit and plant approval issued |
| | | Development and reclamation application forwarded to Land Conservation and Reclamation Council (LCR), reviewed by Development and Reclamation Committee deficiencies identified for response by proponent |
| | | Committee recommendations forwarded to LCR Council, who issues final approval/refusal this is forwarded to ERCB |
| | | ERCB issues five year mine licence |



The committee's 15 members, from all concerned departments, put anywhere from 15 to 30 conditions on approvals. These conditions can cover such concerns as surface run-off control, erosion control, soil handling, salvage and replacement, groundwater monitoring, overall reclamation and revegetation.

And, all along the way, the operation is monitored by teams of reclamation officers from Alberta Environment and Alberta Energy and Natural Resources (ENR). If any of the conditions of the approval are not being met, the mine can be shut down or forced to change its operations.

Jeffrey L.R. Bondy, mineral development co-ordinator for the Alberta Forest Service of ENR, says the service's "first responsibility is to ensure the company complies.

"If the field staff tells us the company isn't complying, we either take it to the council, or back to the review committee.

The AFS is concerned because forestry is one of the province's largest renewable resources.

"We're very concerned about reclamation. We're confident it can be done, but it's a "show me" attitude."

Reclamation officers inspect each site at least two or three times a month, checking to see companies follow their plans and that conditions of approval are met.

Interested departments and agencies, which may all have different expectations of the company, and want different action in case of non-compliance. For instance, in enforcing regulations, the fish and wildlife department has preferred prosecution of offenders, while the environment department has traditionally preferred to co-operate with non-compliers to find a solution to the problem.

Overall, says Trans Alta's Railton, the increased legislation has been effective. "They had to have legislation to force corporations to take a more responsible position on reclamation. Without legislation, we'd still be in the '60s when people did little more than level their spoil piles."

But he urges better liaison between industry and government — particularly when new policy is being considered.

For instance, it was once a requirement that each company guarantee three metres of "good stuff" on the surface.

"The Coal Association thought it was too much. Some areas didn't have that much naturally. We didn't feel it was based on research."

After a co-operative research effort between the companies and government in different geographic locations, the requirement was reduced to 1.7 metres. The reduction would save each company "$2 million to $3 million on each mine."

Incidents such as the three-metre dispute could be avoided, suggests Railton, if the government were to change its approach somewhat.

"I suggest a review period — a time in which industry can respond to proposed changes, and the bureaucracy can defend or amend proposals. In the long run, we'd save money and get good results. By letting us know ahead of time we can budget for changes over years. The feedback will help government to make realistic requests.

"Remember, no matter what — the consumer will pay."

Sharon Adams is a Calgary journalism instructor and freelance writer

Robert MacKenzie

# Mine Site Reclamation

## Tough regulations help bring about impressive results

SUSAN BRUN

Spoil piles along the west side of Highway 855.

One of the best ways to observe how surface reclamation methods have evolved during the past 30 years is to drive south from Daysland on highway 855 through the Battle River valley. As one approaches the top of the valley from the north, low mounds of earth — spoil piles – appear on the west side of the highway.

They date back to the 1950s. During that period, land reclamation concepts were in their infancy, so all that was required was to round off the overburden piles and seed them with forage to minimize erosion. Not only did grasses become established but trees and shrubs have intruded — some naturally, others planted — making the area suitable for cattle grazing and a shelter for wildlife.

But the mounds are the most visible evidence that mining activities have occurred in this area. Along both sides of highway 855, and particularly to the east of it, lie about 944 hectares of land known as the Diplomat Mine, operated by Forestburg Collieries Ltd., a subsidiary of Luscar Ltd. At one time or another since 1949 all of this area has been disturbed but 718 hectares have been reclaimed to such an extent that only the huge draglines in the distance are evidence that this is a coal field.

There was a time in many parts of North America when the idea of rehabilitating surface mined areas was unheard of; when companies walked away from mined-out areas leaving behind eyesores in the form of scarred landscapes and huge mounds of excavated soil known as overburden or spoil. Nor was esthetics the only concern. Some unseen legacies associated with abandoned surface mines have included water pollution resulting from erosion of the exposed soil, generation and migration of acidic and toxic chemicals, and air pollution whenever dusts became airborne.

While that scenario has not been valid in Alberta for at least 20 years, very few people are aware of how much has been accomplished in two decades.

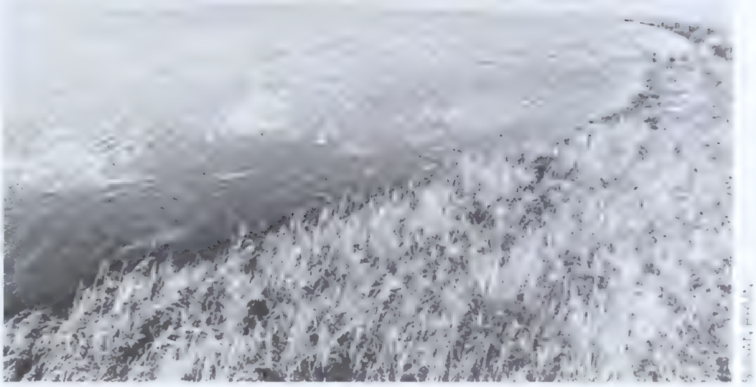
The term "reclamation" generally implies conversion of the mined-out area to an ecologically improved and more socially acceptable condition. Reclamation is said to be successful when a vegetative cover has been established that does not require maintenance or when the land can be used for some other resource management purpose, such as cereal crops.

Here in Alberta, concern about the undesirable aftermath of leaving surface mines in an unreclaimed state led to increasingly detailed government control over reclamation activities, beginning in 1963 and culminating in the Land Surface Conservation and Reclamation Act of 1973 which is used today to regulate all aspects of coal mining operations.

Prior to this, mining companies were not required to remove and stockpile topsoil before excavating the several metres of overburden or dirt that usually lies on top of coal seams. But provisions of the 1963 Surface Reclamation Act stated that mined areas had to be levelled and contoured to provide water drainage and allow normal farming practices to become possible. In response to these requirements a good deal of Diplomat's mined area is now producing forage and some cereal crops in yields comparable to those grown on undisturbed fields nearby.

Even though topsoil vanished under piles of overburden when the mine was excavated, the spoil was mostly glacial till which by itself is capable of supporting forage. Extra fertilizer was required initially to get good cereal crop yields but fertilizer demand is thought to be about normal now for some of the established fields.

Stan Tracy, manager of the Land Conservation and Reclamation Council, says



Forestburg spoil piles before reclamation (center)

The Diplomat Mine Pond, a fishing pond created from the "last cut" of the Diplomat Mine's box cut operation (top)

Ron Evans showing area at Paintearth Mine site where topsoil layer has been removed and stockpiled (below).

the 1973 act "really started the ball rolling.

"We began to require an immense amount of background paper. The council could make recommendations to the minister based on the viability of reclamation."

In addition, the act has teeth. Industry can be forced to reclaim, to bring the land back to its original conditions, or better.

To ensure this, companies are required to post a $25,000 security deposit prior to the mine's opening. Then, they must pay between 25 cents and $2 a tonne (depending on the ecological zone) to guarantee reclamation.

"It really adds up," says Tracy. "The more production, the more surface disturbance, the more deposit."

While no mine which has posted a deposit has reached the abandonment stage yet, work has started at half a dozen sites. "When we are completely satisfied with the reclamation, we issue a certificate, and return part of the deposit. Reclamation is very slow on large sites. As the years go along, we will refund part of the deposit (eventually, as the entire site is satisfactorily reclaimed, refunding all of the deposit)."

The deposit not only ensures that successful mines reclaim, but if an operation goes bankrupt, there will be money for reclamation.

"Over 10 years a company might post $3 million and if they do a good job of reclamation, they'll get the money back, with interest."

One interesting variation on the reclamation theme can be seen beside highway 855 in the guise of Diplomat Mine Pond. At one time, this area was the last cut of the box cut operations typical of surface mining. This results in the last hole being located a long distance from the first one (which has a pile of unlevelled spoil beside it). Because it is generally too costly to transport spoil long distances from the first cut to the last, reclaimed areas generally have one low spot in them, corresponding to the last cut. In this particular instance a fishing pond was created which has been stocked with trout and has become a popular roadside park.

About 275 hectares of the Diplomat Mine have been reclaimed according to the 1973 standards requiring segregation of topsoil and replacement of it once the overburden has been levelled, followed by revegetation.

"Agronomists told us we wouldn't be able to return these fields directly to cereal crops without first seeding them with legumes", says Ron Evans, manager of Forestburg Collieries' Paintearth Mine, "but we thought it was reasonable for a farmer to ask whether topsoiled land could be put back directly into cereals. So we went out and did it anyway and have proven we can get crop yields as good as on nearby undisturbed land using similar farming practices. In fact, one farmer usually works both the reclaimed fields and his own farm."

Reclamation standards contain a clause that bothers mining companies because it states that land must be returned to a level of capability for production at least equal to its previous level. "It's the *'at least'* part that is bothersome", explains Evans, "because that sort of suggests we are expected to get yields that are *better* than before which is not a fair expectation."

Topsoiled fields at Diplomat have successfully grown wheat, barley, oats and canola. In recognition of its achievements, Forestburg Collieries has been awarded five reclamation certificates from the Land Conservation and Reclamation Council. "That's the council's way of saying they're pleased with the way we brought the land back to life", said Evans.

At the nearby Paintearth mine, reclamation procedures are incorporated into the

An area at Forestburg Collieries Paintearth Mine where topsoil is being replaced (left).

Reclaimed fields with active mining in background (right).

Harvesting a forage crop on a reclamation test plot in the Battle River area (below).

daily mining activities to such an extent that topsoil removed from an area being mined can often be placed directly over an older reclaimed area. Evans claims that land is normally out of production only three to five years using continual reclamation procedures.

The successful experiences at Diplomat do not tell the whole story, though, because variable soil properties can have a large influence on revegetation results. For example, the area south of the Battle River is characterized by a thin topsoil layer underlain by bedrock shale which has a high sodium-clay content. These so-called sodic spoils will not support plant growth by themselves and yet they and thin topsoils are commonly found throughout the great band of underground coal seams that sweeps in twin arcs from the Valleyview-Swan Hills region to southern Alberta.

Learning how to reclaim spoils like these, as well as understanding the impact of mining on groundwater conditions and the best types of vegetation to be applied to reclaimed soils, has led to the creation of the industry – government Plains Coal Reclamation Research Program jointly managed by the Alberta government's Reclamation Research Technical Advisory Committee (RRTAC) whose members include Alberta Environment, Agriculture, Energy and Natural Resources and the Alberta Research Council. Coal industry members include all six companies presently active in plains coal mining.

Paul Ziemkiewicz, RRTAC's Chairman, hastens to point out that most of their research investigations have been going on for too short a period (one to three years) to draw definitive conclusions about their findings. As Ziemkiewicz points out, "roots grow, crops mature and soils develop over a fixed rate of time which we can't accelerate. We're locked in to studying what happens for at least five years until we get something resembling stable conditions."

One promising development has been the discovery that orphaned mine areas (so called because they were abandoned by mine companies) that were once thought to be unreclaimable, can be rehabilitated using ash from power plants as a soil amendment. For instance, researchers from Alberta Environment's land reclamation branch — who are members of RRTAC — are revegetating orphan sodic spoils near Forestburg by treating them with bottom ash removed from the furnaces of the nearby Battle River Generating Station (see story p. 12).

The reclamation branch has been involved in a number of coal mine reclamation projects, all of which have been funded by the Alberta Heritage Savings Trust Fund, which also partially supports the RRTAC program.

"If mining activities ceased prior to 1963 when the Surface Reclamation Act made companies responsible for reclamation," said Lawrence Kryviak, head of Alberta Environment's reclamation branch, "we will buy the land for a nominal fee and try to reclaim it to standards established by the Land Conservation and Reclamation Act." The first strip mine reclaimed by the department was near Three Hills. Others near Taber, Morinville and Canmore have been completed and an orphaned area near Bow City is presently being tested to see which types of soil amendments are most suitable.

According to Kryviak, about 80 per cent of all surface mined areas potentially eligible for reclamation by Alberta Environment have already been reclaimed and the others are either not for sale or research must be completed before the bulldozers move in.

As RRTAC research information becomes available, it is made known to government agencies and mining companies alike. This means that when industries ask government to approve their reclamation plans, both parties have access to the same data, thus facilitating expedient decision making.

In the meantime, RRTAC has until 1989 to complete its work, so if all goes well, the 1980s may become known as the "turning point" decade in Alberta's land reclamation history.

Robert MacKenzie is a freelance researcher and writer in Edmonton

Jim Wilson

# *Coal's Social Impact*

## How development affects communities

DON'T WORRY.... WE'VE NEATLY STACKED THE WHOLE TOWN OVER THERE, AND YOU CAN HAVE IT BACK IN 1997!
CAFÉ
GAS

MARTHA JONES

If only 30 or 40 metres of earth separates your town or your farm from a few billion tonnes of coal, it's a virtual certainty that some day a resource company will come along with plans to strip your home and all the other unnecessary overburden off the valuable coal in preparation for a full-blown surface mining operation.

And even if you only live near the deposit, you can be certain your life will be affected when a thermal power generation plant is built in the area to burn that same coal in an economical fashion.

"Coal is synonymous with Alberta," says John Shires, head of Alberta Environment's community affairs environmental assessment division. "Almost half the province is underlain by it. We can't predict when, obviously, but there's going to be some point in the future when that coal is needed, and the lives of any people in the deposit area will be drastically altered."

Shires and others involved in evaluating the social impact of major coal and thermal plant developments hasten to say that such life changes are not always negative. It all depends on how early the people and communities affected become aware of and involved in the development and how receptive the company or consortium involved is to dialogue and compromise.

Carey Johannesson works for Gulf Canada in its environmental planning group, and it's one of his jobs to make certain that at the very least, the social positives outweigh the negatives in any major corporate development. His prior experience with Alberta Environment took him into several communities affected by megaprojects, and his master's thesis was on the social impacts of displacement and relocation on those affected by a development.

"When you have any kind of large-scale development like coal or a power plant there are two major impacts on the people in the area," Johannesson says. "You're taking up their land — even if you plan to give it back to them at some future date — and you're adding people to a community that already exists, people who are probably quite different than those already there."

For some, who must relocate because the mine will destroy their homes or farms, the experience involves losing their familiar sources of economic and emotional stability and even proximity to family and friends, if they must move from the area.

"The problem until recently, in too many cases, has been that when people have been moved it's been treated as simply an economic rather than a complex social consideration," Johannesson says. "Companies have often been good about economic compensation to those affected, but have seldom given much thought to the social impact questions involved, leaving people completely to their own devices in re-establishing their lives."

The result has generally been ill feeling about the project involved, unpleasantly disrupted lives and numerous adjustment problems for both the people and the company. "It would be so much better," Johannesson says, "if the company would deal with the whole person, the whole family, the whole community, rather than simply sending out a land man."

There will be many situations in such developments where "there's a $3 million farm with a Lear jet sitting on its own private runway — and that sort of person is perfectly capable of looking out for his own interests."

But older residents and those who have never had to develop any particular sense of worldliness or business acumen will almost surely need help. "What we need is a good evaluation or selection process which would identify the people who need help — and then a procedure by which they get it."

Johannesson points to the emergence in the U.S. of relocation teams on which a number of government or company-employed specialists in financial, legal and social counselling are automatically made part of any major development, charged specifically with helping those who for any reason are unable to completely help themselves.

BILL BRENNAN

**John Shires**

But social impact doesn't end with people who are forced to move. There are also problems for those who stay in the community, and for those who relocate into it to take up the newly created jobs. And these problems have seldom been addressed either, Johannesson says.

Local residents may expect to find easy employment in either the construction or operational phases of the project, only to find they lack the requisite skills or simply don't belong to the union. Jealousies can develop rapidly when skilled and unionized workers move into the community to take up those coveted and lucrative jobs.

"The people moving in will also generally be younger, more highly mobile and accustomed to urban lifestyles," Johannesson says. "Those who have decided to and have been able to stay in the community have a heavy emotional and financial commitment to it and remember what it was like in the past. They won't always be happy with the way the new people are changing it. But on the positive side, this community growth can revitalize the community, with new people bringing in new ideas."

Again positively, the community expansion can bring new recreational, health and educational facilities and give the economy a boost. Negatively, there can be dramatic inflation, heavy traffic problems, increased crime, higher taxes to pay for the new facilities and a host of other difficulties. The net result is a period of uncertainty and instability in the community as it wrestles with change.

One solution to some of these problems is found in the approach taken by Alberta Environment when it established a new laboratory in Vegreville, thus becoming a major employer (and potentially a major disruption force) in the community. "They set up a welcoming committee and teamed up people coming in to work at the lab with people already there and with people in the community — sort of an 'adopt a stranger' program," Johannesson says. Tours of the community gave the newcomers an idea of its identity and spirit, and a mutual sense of trust and co-operation resulted.

Sometimes, the thermal coal or generation consortium decides to create an instant town on the site, either for the duration of the construction phase or as a permanent community to house mine and plant workers. Whichever the selected approach, the company involved will normally stick by it because of the enormous cost implications: a recent B.C. government study indicates it costs about $40,000 per capita or $150,000 per worker in current dollars to build a new town, and perhaps 10 per cent less to expand an existing one. And problems seem inevitable.

"In new communities or company subdivisions attached to an existing town people don't usually have a sense of privacy because they work with the same people who become their neighbors at home," Johannesson says. "In a normal community everyone blends in, everyone does something different.

"You also find in a new town that you've assembled a bunch of people who are strangers. They have no circles of friends, no established focal points like community groups or churches. You have to establish those social things very quickly to avoid trouble – but unfortunately they take time."

**Carey Johannesson**

Tumbler Ridge, an instant community in northeastern B.C. created to serve the area's extensive coal mining operations, is a case in point. It has also become an experiment in (its designers hope) how to do it right. The B.C. government hired architect Richard Rabnett to supervise the community's layout, and Rabnett approached the design as an exercise in realistically appraising the potential problems of such a town and then planning it to make the occurrence of problems as unlikely as possible.

Social centres such as schools and community centres where people gather are located close together to create a social focus and to remove the need for travel between them: such travel creates both the temptation and opportunity for mischief, crime and other problems. Other psychological tricks include a somewhat circular pattern of roads around the downtown core of the community, with residential streets radiating outward from it and quickly narrowing into funnel-shaped intersections. The funnels act as a sort of

School children in the new hamlet of Keephills. The entire hamlet was rebuilt six kilometres away when the Highvale Mine planned to locate a new pit on the site of the old community.

gate to encourage residents to think of their neighborhood as "theirs", not part of the commonly "owned" core space. And once in the neighborhoods the streets curl and dead-end to discourage through traffic, inviting people to at least begin to recognize their neighbors — and to make crime more difficult because strangers will be more easily noticed.

Finally, the hope is simply to give the community enough breaks through design techniques that its residents can develop a meaningful sense of community and community pride, which in turn will give Tumbler Ridge the stability it needs.

Time in fact is an all-important aspect of the social impacts of major developments. In a new town it can enable strangers to meld into a true community. It can help people who remain in an existing community to adjust to their new society and help it restabilize. It can enable newcomers drawn by new employment opportunities to blend in, to get to know the "oldtimers" and their concerns. It can make it possible for a community like Fort McMurray in Alberta's oil sands, which experienced enormous growth over a very few years, to adjust and reestablish its identity.

But time can also lead to the decline or even death of a town when its major or single industry experiences market reverses, or, for example, the coal seam is depleted. In such cases it's unlikely the companies involved will be willing or perhaps even able to help with relocation. The town will have paid for all the infrastructure required by a large and active community only to see its workforce no longer employed.

"In that sort of situation it ends up being a government responsibility," says Gulf's Johannesson. "Agencies like Canada Manpower and Alberta Manpower already have programs to help people move from a depressed area to one with more opportunity, but perhaps we have to find other ways to ease the social impact of what is sort of the un-development of an area."

With all the potential pitfalls it's likely that most companies share the apprehension of existing residents when the prospect of a move into an established community arises. Nevertheless, success is possible. One of the best examples of a positive approach to mitigating community disruption is the TransAlta Utilities $650 million thermal coal project at Keephills, about 70 kilometres southwest of Edmonton. TransAlta's expansion program for the Highvale Mine and construction of two new thermal plant units there would not simply affect the community — the projected new pit would completely wipe out the entire hamlet.

In 1976 TransAlta first made contact with residents of the community in the beginning of what has become a lengthy association among the residents, the company and the provincial government. The source of the problem was TransAlta's desire to expand its existing operations within its 110-square-kilometre permit area. Projections at the time suggested the need to open what was then called Pit 6 by 1992 to cope with anticipated thermal power generation demands. (The site is mined for TransAlta by Manalta Coal Ltd.)

"TransAlta hoped that by becoming involved in the community well in advance of the actual operation, the potential relocation problems could be avoided," says Gary Prokop, projects representative in the company's generation planning department.

There were only four families living in the hamlet itself, but that tiny community was the regional focus for another 105 families in an area of about 225 square kilometres. Local residents formed the Committee On Keephills Environment (COKE), and identified two key issues: what could be done to keep the hamlet alive, and how land acquisition and land compensation would be handled by TransAlta.

Numerous meetings have finally formulated a land leasing approach that is satisfactory to both parties, but the company has yet to enter into such an agreement, preferring to purchase the land outright. Negotiations are continuing on the subject of compensation through purchase.

But it was the effective destruction of the hamlet itself that became the prime focus of COKE and TransAlta. "We agreed to move the community to a new location in the area, and to help the people involved in every way we could," Prokop says. "They selected a new site for the town about six kilometres away, and we brought in a planner to help design the new community. The

Jim Wilson

# *What You Can Do*

SUSAN BRUIN

All's not lost if you find an energy company is contemplating using your back yard as the epicentre of a thermal coal generating plant and an accompanying strip mine — in fact it's even possible to get money from the company itself to help you pay for expert consultants.

It won't be easy; it will take enormous amounts of time and effort and not inconsiderable amounts of additional money; and you may not be completely seccessful. But a carefully-planned program will guarantee that at least some of your concerns will be addressed and solved.

"My biggest piece of advice to anyone in that situation would be to know your opponent well," says Lorna Smith, one of the founders of HOPE — the Heathburg Organization to Protect the Environment. HOPE was formed in 1977 when Fording Coal announced plans to develop a strip mining operation near Alix. The result of their work was that the company decided to stop pursuing the development, at least for now.

Bernie von Tettenborn, chairman of a similar group called the Roundhill-Dodds Agricultural Protective Association, which also responded successfully to a $2.5 billion thermal power plant proposed by Fording in 1974 agrees, but adds some further advice. "Get the people in your area who will be affected together and form a legal society. The you're ready for the long process ahead of you."

A third piece of advice might be to know thoroughly the procedures the resource company (the "proponent" in legalese) must follow before it can ever lay walking dragline to overburden or coal.

Bob Paterson, manager of the ERCB's coal department, says there are at least four distinct stages a company must go through in applying for a mining permit. First, it must submit a confidential preliminary disclosure document to Alberta Energy and Natural Resources outlining its plans and proposed site. This is reviewed by a number of government departments. If it passes that hurdle the company prepares detailed engineering studies and a formal proposal to the ERCB. The third stage is a public disclosure meeting in the area affected, at which written materials about the project must be available and questions and concerns of residents are addressed. Finally, the actual application for a mine permit is submitted to the ERCB and a public hearing is convened at which all interested parties may submit briefs as intervenors.

The Alberta environment minister can require the company to undertake an Environmental Impact Assessment (EIA) for the project. The EIA document must describe in detail the project, the existing environment and the possible impacts of the development on present land uses, air, water, geology, soils, vegetation, fauna and human environment.

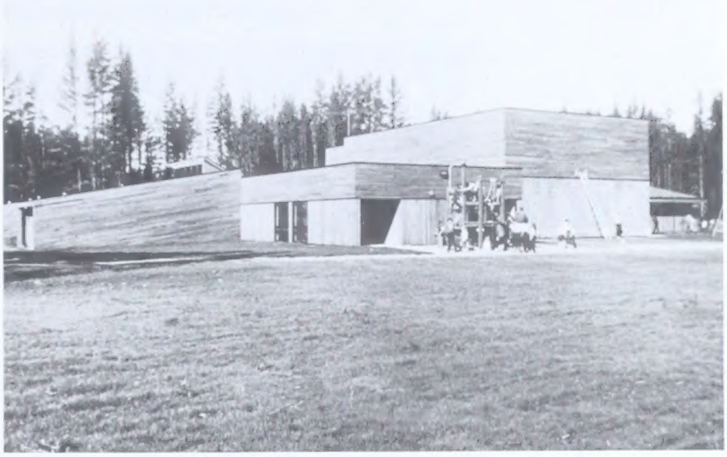
This report is evaluated by a number of government departments and agencies, and the company is expected to involve the affected public in meetings, investigations and other EIA activities. If there is insufficient information or an apparent lack of public input, the EIA can be sent back to the company for revision. The eventual evaluation of the EIA will have a distinct bearing on issuance of a mining permit.

But the responsibility is considered the individual's, not that of the company or the government, where any negotiation or intervention activity is planned. Those who have been through the process appear to agree that the following steps should be taken as quickly as possible after a development becomes public knowledge:

- Form an association under the Alberta Societies Act;
- Raise sufficient funds to be able to employ special consultants and competent legal advice;
- Hire those specialists as quickly as possible and involve them in all activities of the association;
- Make contact (Alberta Environment can help) with other groups that have formed for similar purposes;
- Ask government bodies including Alberta Environment and ERCB for advice;

Bernie von Tetten born, chairman of the Roundhill-Dodds Agricultural Protection Association.

The new school building at Keephills.



BOB STORRIER — TRANS ALTA UTILITIES

- Gather every shred of information you can about the company, its project, its potential markets, its financial situation and its reputation in similar social impact problems; and
- Go directly to the company or work through the ERCB to negotiate the extent of the company's responsibility for reimbursement of intervenor expenses (the company is required by law to help);

Bill Davies, president of the Wabamun Homeowners Association, says his group's intervention activities concerning a TransAlta Utilities plan to extend its operations in the area cost $38,000, of which they eventually received $25,000 back from TransAlta through the ERCB program.

"We went into it without knowing if we'd get any financial assistance at all, though," he says. Eventually, the ERCB denied the permit extension, but Davies says there's nothing to stop the company from trying again and they're continuing negotiations on several points of concern.

"I think the key might be your attitude as a group," he says. "We did not take the attitude that TransAlta should not mine —this is an excellent and extremely economic mining location and it would be unrealistic to expect that we few people could block something that would be of benefit to the whole province. But we investigated it all and pinpointed the circumstances where incompatible uses of the land would create needless conflict. We want the permit stopped at about half a mile from the lakeshore to protect our water supplies and our environment.

"Then we concentrated on factual and technical matters, not our purely emotional response to the project."

Lorna Smith agrees with that positive approach. "We didn't try to tell them they couldn't mine," she says. "We said instead that we didn't mind if they dug out the coal, if the things we think important are protected. Then we threw all our 'ifs' at them. That's also the way to get government help — take the positive approach."

planner went through 12 re-designs before a final choice was made, and TransAlta paid for acquisition of the new land, housing construction, a new school, roads, landscaping, moving and other costs. The total package was worth about $4 million."

Ironically, the economic downturn has delayed the new pit indefinitely, but Prokop says the move has still been for the best. "Sometime in the future we'll still be mining in that pit or one similar to it, and we wanted to complete the move well in advance so there would be time to sort out all the problems. That need hasn't changed — there's just a bit more time."

Alberta Environment's John Shires agrees the Keephills project has been remarkably problem-free. "It's been going now for about seven years, and it has included a number of very sensitive issues. And the level of co-operation among all parties has been excellent. The residents and people from TransAlta can sit down in an informal meeting and deal effectively with almost any issue that comes up, without the need for any sort of formal framework."

Shires, however, warns that this comfortable situation wasn't always the case. "It wasn't that good at the start, but everyone worked hard to find ways to get along. Today I have to say the Keephills project is the major example within Alberta experience that recognizes the need for full public involvement."

He notes there has been some improvement over the past few years in the way most companies operating in Alberta approach the social impact question in mega-developments. "Unfortunately, though, the improvement for the main part has been from specific companies, not from industry as a whole. When problems arise from a development moving into a populated area they generally stem from an unwillingness on the part of the project developer to share with the impacted community the information it needs to understand what is about to happen and how it will affect their lives."

Gary Prokop says TransAlta is proud of its progress in Keephills, although he admits everyone isn't completely satisfied. "It depends on the individual. Some people have purchased new farmland nearby or elsewhere in Alberta, some have retired to Edmonton or B.C. And so far seven families in addition to the four we originally moved have purchased lots in the new Keephills hamlet so they could stay in the community."

Prokop says a survey the company had a consultant conduct shows about half the people involved expressed satisfaction with their treatment. Half for one reason or another were unhappy, but he observes that only two families have gone to the Alberta Surface Rights Board with complaints.

"But we're committed to keeping track of how effectively we're handling the situation," he says. "We're continuing our longitudinal studies in the area — our survey consultants have conducted two surveys, one at the start of construction and one in the middle, and we'll conduct a third study when it's complete. We hope the surveys will provide us with three social photographs of the community taken at these different times, which should tell us how social attitudes have changed, how effective we've been and where things might have worked better if they'd been handled in a different fashion."

And he says there are two key factors in the smooth functioning of the Keephills project. "From the company viewpoint, it all depends on your senior people. It doesn't matter what a guy like me says or does if he's not supported by the senior people in the company — and I've had that support. But it's also important to look at the other side. There was an enormous effort on the part of the people in the Keephills community who worked on a voluntary basis for hundreds of hours. We've all been able to work together as a team to find solutions that enhanced the positive impacts of the development and lessened or mitigated the negative impacts. The biggest plus in making it all work has been the excellent attitude of the people in the community."

Jim Wilson, marketing co-ordinator for the Calgary engineering firm of Reid Crowther and Partners Ltd., is a freelance journalist.

Maryhelen Vicars

# *Small-scale Coal*

## How development affects communities

Alberta's oil industry is not all giant draglines and mammoth Japan-bound unit trains.

Dotted here and there throughout the plains coal belt are a number of small mines whose fortunes are tied less to the vagaries of the international marketplace than to the vagaries of the Alberta winter. Most of their customers arrive in pick-up trucks (or even sedans with shovels and bags in hand).

Small-scale coal mining was nearly wiped out when cheap and plentiful natural gas reached rural Alberta. During the 1960s a lot of coal stokers were hauled out to the barn or scrapped.

But business has been picking up steadily, as many of these old stokers are being cleaned up and pressed into service once again for home and farm heating. By most estimates, an average-sized home can be heated for about $200 or less per year.

Tom Courtney of Courtney Berg Industries Ltd. in Linden, Alberta (a manufacturer of coal-fired hot water heating units) quotes figures for the heating of chicken barns in his area. A chicken farmer in his area with three 4.5-by-90-metre barns paid $12,000 per month for natural gas two years ago, Courtney told the Calgary Herald, while a nearby farmer with the same sized operation heated with a coal-fired stoker and hot-water boiler system paid only $3,000.

Luscar Ltd. did a marketing survey last year of its Diplomat mine at Forestburg, and discovered that while there have been a fair number of conversions, most of their rural customers had been heating their houses with coal for 30 to 40 years.

While the number of farm and acreage dwellers willing to go to the expense of converting to coal furnaces may not yet be great, there seems to be a growing number of families supplementing gas heat with coal for fireplaces or wood-and-coal stoves. Jim Nordby of the Dodds Coal Company says a lot of acreage owners are showing up on Saturdays for a small load or even a few bags of coal. "We're selling coal to people from the outlying areas around Edmonton that we never saw five years ago," he says.

Heating with coal, although easy on the budget, is not without problems of its own.

"I don't think it's for city folk," says Levy Siega, proprietor of the Warburg Coal Company, a family-run operation which is sharing the resurgence in the domestic market.

For one thing, stoking furnaces and hauling ashes can be a tedious and messy business. And for another, although Alberta's coal is low in sulphur content, a massive conversion would have an impact on urban air quality.

The story of the Warburg coal operation is a good illustration of the changing fortunes of the small-scale mines over the years. Levy Siega is a professional geologist who has been in the coal business as a foreman, mine manager and consultant since 1947. He bought the Warburg mine about seven years ago when it was "at rock bottom" and on the verge of closing.

Levy Siega, owner of the Warburg Coal Company (below left).

An Edmonton Beach couple loading coal for their cottage fireplace (below).

Warburg-area farmers loading store coal (left).

Water and stabilizing problems forced the conversion of the mine, established about 40 years ago as an underground mine worked with ponies, to open pit. It went through the boom and bust of the coal industry over the four decades, Siega says, and had a production of only about 3,000 tonnes per year when he and his family took it over.

The production is now at about 5,000 tonnes. During the peak winter months there is enough work to hire a couple of local people; during the summer the mine is closed.

Says Siega proudly: "We advertise that we have the best coal in north-central Alberta. If my customers can buy a better load, I'll give it to them free." He says the Warburg coal has a heat value of 10,500 BTU (while most of the coal in the region is assessed at about 9,000 BTU).

"My customers are my best advertisers."

Maryhelen Vicars, a former journalist, is the freelance editor of *Environment Views*.

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Prepared by Doug Ramsay

# *Using Environment Views in the Classroom*

> *". . . coal will become more and more crucial to the world's energy supplies."*

Perhaps it comes as a surprise to many of us (and therefore an even greater surprise to our students) that coal remains part of the long term solution to depleting oil and gas reserves. More important to Alberta is that this province will be in the forefront of coal development.

As Norma Ramage writes in her article, "The Future of Coal", page 5, "Canada is the world's fifth largest coal producer and 70 per cent of that coal is in Alberta. In fact, coal deposits underlie about 300,000 square kilometres of Alberta, or almost half the entire province!" This translates into an Alberta coal reserve of 48 billion tonnes. Ramages continues, "This amount of coal has an energy value equivalent to 65 billion barrels of oil, about 10 times Canada's proven crude oil reserves."

Given statistics like these, social studies and science teachers should be looking for areas of the curriculum where students could be made aware of the importance of coal, its environmental impact and its future in Alberta. Unfortunately neither social studies nor science provides many opportunities for introducing coal into the regular curriculum. There is, however, one area in social studies and one in science where an indepth study of coal could be undertaken. As well the usual student projects in some science courses and the one-quarter unstructured time in social studies could be used for the study of some aspects of coal.

## Relationship to Curriculum

### *Social Studies*

The grade 9 social studies program presents an ideal time for the study of coal, particularly as a case study for Topic C, Industrialization in Canada. While coal is not a "new technology" many of the methods of extraction and uses of coal are certainly excellent examples of new technology. As well, coal presents an interesting case study of all three levels of industry: primary, secondary and service. The following questions, for which many of the answers are found in this issue of Environment Views, could be used as guideline for a major study of coal resulting in the students answering the Topic C value question; "Should the introduction of new technologies be controlled in Canada?"

- How much coal does Canada and Alberta have? (Develop a statistical profile of coal in Canada and Alberta including such areas as amount, types, export and domestic markets, present and future demands.)
- How does coal compare to other energy sources? (such as electricity, oil and gas, nuclear)
- What problems are associated with Alberta coal? (such as transportation costs, uncertain demands, changes in technology)
- What does the future hold for coal? (such as foreign and domestic uses, new technologies, new uses, coal exploration)
- What are the environmental concerns surrounding coal? (such as pollution and land reclamation both present and future)
- What are the social concerns associated with the impact of coal development? (such as community relocation, safety standards)

### *Science:*

It appears that the Science II program (with its built-in flexibility) would provide teachers with the opportunity to introduce coal as a unit of study. The following general questions (for which many of the answers can be found in this issue of Environment Views) could be used as a guideline for students.

- How is coal mined? How may it be mined in the future?
- What are the present uses of coal? What uses are predicted in the future?
- How does coal compare to other energy sources?
- What are the environmental concerns associated with coal?
- What is the overall future of coal?

If undelivered, return to:

Environment Views
Alberta Environment
9820 - 106 Street
Edmonton, Alberta T5K 2J6

# *Environment Update*

## · Hazardous Wastes

The Proceedings of a roundtable discussion on law and policy for the management of hazardous waste in Alberta, sponsored by the Environmental Law Centre, are now available.

The discussion, held in Edmonton in late October, involved representatives from government, industry and special interest groups in discussion of issues involved in siting of facilities; obtaining compliance; victim compensation and spill response; recycling of hazardous waste and post-closure care.

The Proceedings are available from the Environmental Law Centre, call 425-6740.

## Native Issues and Resource Management

The Banff Centre School of Management is offering a course January 22-27 on native issues and resource management. This course is designed in response to the challenge which many governments and resource developers have to face. The handling of land and treaty claims, cultural differences, the integration of modern development and traditional lifestyles, social impacts and the desire for skills training and communication are but some of the issues that developers and government regulators must find better means to resolve, without resorting to confrontation.

For further information, call Susie Washington, program manager, 762-6137.

## Agricultural Land Hearings

The Environment Council of Alberta, is nearing the end of its series of public hearings on agricultural land use. The remaining hearings are scheduled for:

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|---|---|
| Evansburg | November 15 |
| Barrhead | November 17 |
| Peace River | November 22 |
| Grande Prairie | November 24 |
| Vegreville | November 29 |
| Red Deer | December 1 |
| Edmonton | December 5/6/7 |

For further information call 427-5792 Edmonton; Zenith 06075 outside Edmonton.

## Environmental Biologists

The Canadian Society of Environmental Biologists meets monthly in Edmonton. For information, call John Lilley at 427-5792 or Lewis Cocks at 420-2600.

## Acid Precipitation

The Canadian Institute of Resources Law has recently published *Acid Precipitation in North America: The Case for Transboundary Co-operation*, by Douglas M. Johnston and Peter Finkle. (75p.)

This publication explores the international legal solutions to the difficult problem of transfrontier pollution between the U.S. and Canada. It is available from:

Canadian Institute of Resources Law
Rm. 430, Bio-Sciences Building
Faculty of Law
University of Calgary;
Calgary T2N 1N4.
Telephone 282-9197.

**If you have a short news item of province-wide interest you'd like to contribute to Environment Update, please send it to the editor at the address on the Contents page. The editor reserves the right to select and edit the items.**

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*Letters continued from page 4*

Dear Editor;

The CPA Environmental Planning and Management Committee wishes to express its support for the continuation of the Alberta Environment publication *Environment Views*. Your magazine provides a very balanced and credible coverage of a wide variety of environmental issues and is a forum for the opinions of government, industry and the public.

We believe that *Environment Views* is an excellent educational tool for students and the general public. The rational approach used in the magazine is a necessary alternative to often sensational and unscientific approach in the popular press. We congratulate you and the editorial board for the impartiality you have achieved and we commend Alberta Environment for funding this excellent publication.

Barry Worbets
Chairman, Environmental Planning
and Management Committee,
Canadian Petroleum Association.